

Park and Ride System  
Nantucket, Massachusetts

Submitted to:

Nantucket Planning & Economic Development  
Commission

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## **1.0 Introduction**

The Nantucket Planning & Economic Development Commission (NP&EDC) is considering implementing a Park and Ride system on Nantucket to service both Steamship Authority and Hy-Line ferry passengers. Ferry passengers typically drive to/from downtown or are dropped off/picked up the downtown waterfront area. In either circumstance, the influx of ferry passenger related vehicles in the downtown area contributes significantly to traffic congestion and reduces the number of available parking spaces which could be used by visitors to, or employees of, the downtown area. The Park and Ride system would consist of a satellite parking lot and a shuttle bus to carry passengers between the parking lot and downtown wharfs.

Tetra Tech Rizzo (TTR) was retained by the NP&EDC to determine parking and bus requirements for the proposed park and ride system. For the parking, this included estimating the required number of parking spaces, determining a potential site and estimate costs associated with constructing the parking lot. For the shuttle bus system, TTR recommended a yearly and daily schedule, determined the most efficient route from the satellite lot to Steamboat and Straight Line Wharfs, located shuttle bus stops at or near the wharfs and estimated upfront capitol costs and annual operating costs associated with the recommended park and ride system.

Steamship Authority (SSA) and Hy-Line (HL) passenger data from 2008, and the results of a transportation survey conducted at the Steamboat and Straight wharfs by ReMain during the summer in 2009 were used in this study to develop the Park and Ride system. This study begins with a detailed analysis of this data.

## **2.0 Existing Ferry Passenger Analysis**

### **2.1 Steamship Authority and Hy-Line Passenger Data**

Existing passenger data for the Steamship Authority (SSA) and the Hy-Line (HL) service for the period beginning on January 1, 2008 and ending December 31, 2008 was obtained from the SSA.

The passenger data for both slow and fast ferries operated by the SSA and HL were compiled into a single set of data which is provided in Appendix A. Based on the frequent number of ships arriving and departing through out the day, no special consideration was given to the operator or type of ferry (i.e., SSA vs. HL or slow vs. fast-ferries).

The data was analyzed by season, by day of week (summer only) and by hour (typical summer weekday and weekend). Due to the recent downturn in the economy it is assumed that 2008 passengers levels are fairly representative of 2009 levels (i.e. equal to or greater), as well as near term future passenger levels and can be used to design the Nantucket Park and Ride system.

### **Seasonal Analysis**

Figure 1 presents the total arrivals and departures by day beginning January 1<sup>st</sup> and ending December 31<sup>st</sup> for 2008, for both the SSA and Hy-Line ferries. Inspection of the figure indicates

that passenger levels begin to rise on approximately June 20<sup>th</sup> and drop off on approximately September 1<sup>st</sup>. During this period, the SSA and HL ferries carry to/from Nantucket an average of 4,900 passengers on a weekday and 6,700 on a typical Saturday or Sunday. The data is summarized by season in Table 1. Table 1 also provides passenger data for the peak summer weeks of July 6<sup>th</sup> to August 23<sup>rd</sup>. During this time period, passenger counts are approximately two percent higher on weekdays and eight percent higher on weekends as compared to the passenger counts for the entire summer.

The daily and hourly analyses presented below are based on passenger data for the peak summer period of July 6<sup>th</sup> to August 23<sup>rd</sup>.

**Table 1 SSA and HL Passengers by Season**

<b>Season</b>	<b>Date</b>	<b>Average Weekday</b>			<b>Average Weekend Days</b>		
		<b>Arrivals</b>	<b>Departures</b>	<b>Total</b>	<b>Arrivals</b>	<b>Departures</b>	<b>Total</b>
Winter	10/26 to 4/19	490	480	970	580	700	1,280
Spring and Fall	4/20 to 6/19 and 9/2 to 10/26	1,370	1,250	2,620	1,360	1,620	2,980
Summer	6/20 to 9/1	2,540	2,320	4,860	3,100	3,580	6,680
Peak Summer	7/6 to 8/23	2,570	2,420	4,990	3,390	3,850	7,240

### **Peak Summer Analysis by Day of Week**

Figure 2 and Table 2 summarize the arrivals and departures by day of week during the peak summer weeks. Friday is the busiest weekday with 6,000 arrivals and departures. Thursday represents an average weekday condition with approximately 5,000 arrivals and departures. Saturday is the busiest of all days with approximately 4,000 arrivals and 3,500 departures (7,500 total). Thus, a typical Thursday (July 17) and Saturday (July 23) were selected for hourly analysis.

**Table 2 2008 Peak Summer Passengers by Day of Week**

	<b>Arrivals</b>	<b>Departures</b>	<b>Total</b>
Monday	2,260	2,430	4,690
Tuesday	2,140	2,180	4,320
Wednesday	2,400	2,440	4,840
Thursday	2,660	2,410	5,070
<b>Friday</b>	<b>3,370</b>	<b>2,620</b>	<b>5,990</b>
Average Weekday	2570	2410	4980
<b>Saturday</b>	<b>3,980</b>	<b>3,540</b>	<b>7,520</b>
<b>Sunday</b>	<b>2,800</b>	<b>4,170</b>	<b>6,970</b>
Average Weekend Day	3,390	3,860	7,250

Note: Peak weekday and weekend days are highlighted

### **Peak Summer Weekday and Weekend Day Analysis by Hour**

Figures 3 and 4 are plots of ferry passenger arrivals and departures by time of day for a typical peak summer weekday and peak summer weekend day. During the week the peak volume of passengers arriving by ferry occurs from 9:00 a.m. to 10:00 a.m. (approximately 850 passengers) and the peak volume of passengers departing by ferry occurs from 3:45 p.m. to 4:45 p.m. (approximately 750 passengers).

On the weekends the arrivals and departures are fairly level though out the daytime hours between approximately 9:00 a.m. and 6:00 p.m.

## **2.2 ReMain Transportation Survey**

The transportation survey of SSA and HL passengers boarding and alighting was conducted during the summer of 2009 by the University of Connecticut for ReMain. Passengers were asked how they travel to/from downtown and how they would improve access to the wharfs.

Approximately 38 percent responded that they either drive and park or are driven to/from the wharfs. The data also indicated that approximately 12 percent of people who currently use public transit would be willing to use a park and ride system and 39 percent of people surveyed on-line indicated that they would be interested in a park and ride system. The results of the ReMain Transportation Survey are provided in Appendix B.

## **3.0 Park and Ride System**

Based on the above data, the peak period of activity at Nantucket's wharfs occurs from approximately the third week in June to the first week of September. Therefore, the park and ride system should be designed to accommodate peak passenger levels and the ferry schedules for this period.

A reduced service could be provided during the "shoulder" months of April, May, early June, September and October. During these months ferry ridership is approximately half of the summer ridership. For the winter months of November through March it is unlikely that the approximately 1,000 daily passengers carried on the ferries during this period would use a Park and Ride system as traffic and parking conditions in downtown are not as congested as in the rest of the year.

## **4.0 Estimated Park and Ride System Participants (Peak Summer)**

The estimate of ferry passengers willing to use a Park and Ride operation was based on existing peak summer passenger data and the results of the ReMain ferry passenger survey. The survey indicated that approximately 38 percent of existing ferry passengers are transported to/from downtown by vehicle. Between 12 and 39 percent indicated at least an interest in a park and ride system. Based on the results of the survey, discussion with staff as well as standard industry estimates for public transit use, it is estimated that approximately 38 percent of existing ferry passengers are transported to/from downtown by vehicle and approximately 25 percent of this group might be willing to use a Park and Ride system. Table 3 summarizes the estimated number of Park and Ride participants for an average weekday, a Saturday and a Sunday.

**Table 3 Estimated Ferry Passenger Park and Ride Participants**

	Daily Ferry Passengers	Existing Ferry Passengers traveling to/from Wharfs via Automobiles	Percent of Passengers traveling to/from Wharfs via Automobiles	Estimated To use Park and Ride Operation	Estimated Ferry Park and Ride Participants
<b>Average Weekday</b>					
Arrive	2,600	38%	25%	247	
<u>Depart</u>	<u>2,400</u>	<u>38%</u>	<u>25%</u>	<u>228</u>	
Total	5,000	38%	25%	475	
<b>Saturday</b>					
Arrive	4,000	38%	25%	380	
<u>Depart</u>	<u>3,500</u>	<u>38%</u>	<u>25%</u>	<u>332</u>	
Total	7,500	38%	25%	712	
<b>Sunday</b>					
Arrive	2,800	38%	25%	266	
<u>Depart</u>	<u>4,200</u>	<u>38%</u>	<u>25%</u>	<u>399</u>	
Total	7,000	38%	25%	665	

It is estimated that the number of ferry passengers which would be willing to use a Park and Ride operation would range from approximately 475 on a weekday and to approximately 700 on a weekend day during the peak summer weeks.

Not all of these participants will park at the satellite parking lot; some may use other modes of transport to the bus stop at the satellite parking lot. However, all participants will use the shuttle bus.

## 5.0 Satellite Parking

The next component of the system that needed to be determined was the size requirement and location of the remote parking facility. Two existing parking lots that are potential sites were identified. These parking lots are evaluated with respect to available parking spaces, availability, roundtrip travel time to/from downtown, access/egress to/from the property and cost.

### 5.1 Required Parking Spaces

The size of the satellite parking lot is based on the number of ferry passengers that would be willing to use the system, the percent which will drive to the parking lot versus the number which maybe dropped off/picked up at the satellite lot (requiring shuttle bus service, but not parking) and finally the number of passengers arriving/departing per vehicle. For this analysis, it is assumed that 70 percent of users will drive to the parking lot. Based on the state wide average for vehicle occupancy (1.2 passengers per car) and the observations made at the Martha's

Vineyard Park and Ride facility by the Vineyard Transit Authority (VTA), it is estimated that the vehicle occupancy for the Nantucket Park and Ride system will be approximately 1.5 passengers per vehicle.

As each ferry passenger who occupies a parking space is at some point both an arriving and departing passenger, the required number of parking spaces is calculated from the average of ferry arrivals plus departures. The calculated number of spaces is increased by a factor of 25 percent to account for turn over, spikes in usage and the potential for non-ferry passenger use of the park and ride operation to travel to downtown Nantucket. Based on the analysis summarized in Table 4, it is recommended that the remote parking lot accommodate approximately 208 parking spaces.

**Table 4 Satellite Parking Lot Spaces**

	Estimated Ferry Park and Ride Participants	% Driving to Park and Ride Lot	Vehicle Occupancy	No. of Parking Spaces	Adjustment Factor	Required Parking Spaces
<b>Average Weekday</b>						
Arrive	247					
<u>Depart</u>	<u>228</u>					
Average	238	70%	1.5	111	25%	139
<b>Saturday</b>						
Arrive	380					
<u>Depart</u>	<u>333</u>					
Average	356	70%	1.5	166	25%	208
<b>Sunday</b>						
Arrive	266					
<u>Depart</u>	<u>399</u>					
Average	333	70%	1.5	155	25%	194

## 5.2 Evaluation of Alternative Parking Lots

Two existing parking facilities were identified by the NP&EDC for consideration as potential parking facilities for the proposed Nantucket Park and Ride system. These include the town property located at Two Fairgrounds Road and the two parking lots located at the Nantucket Elementary School on Surfside Road.

The town property at Two Fairgrounds Road is being considered for redevelopment to accommodate new municipal office buildings, a public safety facility and single family homes. The design for the redevelopment has not been completed and it is unknown when the improvements would be constructed. Until this project is complete, the existing fenced in parking area located on the south side of the town building would be used for parking. Some modifications and upgrades would be required to this area to allow it to function safely and effectively as a public parking lot.

The two properties were compared based on the number of parking spaces, availability, round trip travel time to/from the downtown, access/egress to public ways and cost to prepare the property for use as a Park and Ride facility.

### **5.2.1 Parking Spaces**

The existing gravel parking lot located in the back of the existing municipal building at Two Fairgrounds Road would be upgraded and used temporarily until the property is redeveloped. It is unknown when this redevelopment will occur. The NP&EDC provided a conceptual layout of a potential upgrade indicating that approximately 110 spaces could be accommodated at Two Fairgrounds Road. This layout is shown on Figure 5.

Based on a plan provided by NP&EDC staff, prepared by Kaestle Boos Associates, Inc. dated December 19, 2008, the redevelopment of Two Fairgrounds Road could be designed to accommodate up to 132 public spaces for the Nantucket Park and Ride system and another 166 spaces for staff parking. Therefore, the weekday parking space requirement of 139 spaces would mostly be accommodated by the 132 public spaces. On weekends when most municipal employees are not working, the weekend parking space demand of 208 spaces could easily be accommodated in the 132 public spaces plus the approximately 166 staff spaces (a total of 298 spaces).

There are a total of 98 existing marked parking spaces in the parking lots located at the Nantucket Elementary School. It is estimated that another 10 vehicles could park along the school's access driveway for a total of 108 spaces. A significant disadvantage of the school parking lot is that its parking spaces would not be available except during the summer.

### **5.2.2 Roundtrip Travel Time to/from Downtown**

Based on discussions with the NP&EDC and the NRTA, optional routes to/from downtown were suggested and considered for the Nantucket Elementary School site (Options 1, 2 and 3) and for Two Fairgrounds Road site. Each of the routes considered are shown on sketches contained in Appendix C. Each route was timed during periods of low, medium and high traffic levels during the peak summer period (8:00 a.m., 10:00 a.m. and 12:00 p.m.). The roundtrip travel times for each route are also provided in Appendix C. Option 3 had the shortest travel times and is the preferred route for the Nantucket Elementary School site. Figures 6 and 7 depict the preferred route for Two Fairgrounds Road and the Nantucket Elementary School, respectively. Both of these routes are approximately 3 miles.

Round trip times for the low and medium traffic levels (8:00 a.m. and 10:00 a.m.) were approximately equal for both properties (15 to 20 minutes). However, the measurements taken at noon time (high traffic level) show that the roundtrip time to/from downtown was shorter for the Elementary School (18 minutes for the Elementary School compared to 19 to 29 minutes for Two Fairgrounds Road). Note that these times reflect only the travel time and not loading and unloading. Section 6 of this document provides a detailed analysis of the proposed shuttle bus route with loading/unloading times.

### **5.2.3 Infrastructure**

#### Two Fairgrounds Road

In the interim period, before the area currently used for storage at Two Fairgrounds Road is redeveloped to accommodate a new municipal building, it will need upgrades to accommodate a public parking lot. These upgrades include a new driveway intersecting Fairgrounds Road, new pavement areas in exiting gravel or grassed areas and cold planing and resurfacing of existing paved areas. Pavement markings and signing will also be required. A bus shelter, benches and a bicycle rack are recommended for the site.

**Proposed Permanent Driveway.** The driveway on Fairgrounds Road, being considered by the town, will service the proposed public safety building, located west of the existing town building, the existing parking area, located north of the existing town building and the proposed park and ride parking lot. However, only a portion of this new driveway would need to be constructed in order to provide access/egress to the proposed parking lot. This portion of the driveway is illustrated on Figure 5 and encompasses approximately 9,000 s.f. It is assumed that others will construct the remaining portions. For the new driveway, which is assumed to be permanent, it is recommended that it be constructed with 4 inches of crushed stone, 8 inches of gravel and paved with 4 inches of hot mixed asphalt. Although this design may change based in preliminary and final design, it is a reasonable design for purposes of estimating costs associated with the Park and Ride operation.

**Proposed Temporary Parking Lot.** It is assumed that the parking lot will be used for approximately three years. Therefore, the assumed design for purposes of the cost estimated is less substantial than would be assumed for a more permanent facility.

For the portions of the proposed parking lot currently consisting of sand and gravel or grass (22,100 s.f.), it assumed that these areas will be excavated to a depth of 6 inches, backfilled with 3 inches of gravel and paved with 3 inches of hot mix asphalt. For areas currently paved (18,900), it is assumed that they will be cold planed and resurfaced with 2 inches of pavement.

**Proposed Permanent Future Parking Lot.** Once the future redevelopment of the property is underway a new park and ride parking lot will be constructed. This parking lot will be constructed to accommodate approximately 132 vehicles and will probably require approximately 55,000 s.f. of full depth reconstruction.

#### Nantucket Elementary School

The existing infrastructure at the Nantucket Elementary School is in good conditions and will not require any upgrades with the exception of some NRTA road signs. A bus shelter, benches and a bicycle rack are recommended for the site.

#### **5.2.4 Access**

##### Two Fairgrounds Road

At Two Fairgrounds Road there is one existing driveway which forms a T intersection with Old South Road. A second driveway is proposed which will intersect Fairgrounds Road. This new driveway will cross the existing bicycle path. It is recommended the Old South Road driveway be used as an entrance and the new Fairgrounds Road driveway be used for egress.

##### Nantucket Elementary School

The Elementary School is served by one driveway and it is located on Surfside Road.

#### **5.2.5 Costs**

The cost to upgrade the existing paved area at Two Fairgrounds Road includes full depth pavement construction, short-term upgrades to existing gravel areas, pavement markings, signing, a bus shelter, benches and a bicycle rack. These improvements are estimated to cost \$450,000.

The cost to provide a new 132 space parking lot as part of the proposed redevelopment of the property is estimated at \$700,000. The bus shelter, benches and bicycle rack used at the temporary parking area would be moved to the new parking area. This cost includes design, permitting, site preparation, drainage, pavement installation, signing and pavement markings.

Installation of signs, a bus shelter, benches and a bicycle rack at the Nantucket Elementary School is estimated to cost \$51,000.

#### **5.2.6 Summary and Recommendation**

Table 5 provides a summary of the comparison and analysis conducted for the two alternative parking lot sites. The travel time between each lot and downtown are similar. The number of spaces provided at the temporary Two Fairgrounds Road parking lot and the Nantucket Elementary School parking lot are similar, yet both are undersized for the weekday demand of 139 spaces and weekend demand of 208 spaces. However, the parking supply at the Two Fairgrounds Road facility will expand in the future to accommodate approximately 132 spaces on weekdays and 298 spaces on weekends. Also, the Elementary School would limit the Park and Ride operation to the summer. As seen in the analysis of the ferry passenger data, the Park and Ride system may operate through some spring and fall weeks when school would be in session. Because of the limitations on space and availability associated with the Elementary School parking lot, it is recommended that the property at Two Fairgrounds Road be used for the remote parking lot. The shuttle bus service which will provide a connection from the remote parking lot and downtown will be designed assuming that Two Fairgrounds Road is the preferred location for the parking lot.

**Table 5 Potential Satellite Parking Lots**

	<b>Two Fairgrounds Road</b>	<b>Nantucket Elementary School</b>
Distance to Steamboat Wharf	3.0 miles (round trip)	3.0 miles (round trip)
Estimated Round Trip Travel Time (excluding loading/unloading time at bus stops)		
at 8:00 a.m.	15 minutes	16 minutes
at 10:00 a.m.	17 minutes	20 minutes
at 12:00 p.m.	20 to 29 minutes	18 minutes
Number of Spaces	Temporary: 110 spaces Permanent: Potentially 132 spaces on weekdays and 298 on weekends	98 to 118 spaces
Availability	Year round	Last week of June to last week of August
Access/Egress	Old South Road/Site Driveway. Sight lines in both directions appear adequate.  Fairgrounds Road (under design by town)	Surfside Road/Site Driveway under Stop Sign control. Sight lines in both directions appear adequate.
Required Infrastructure Improvements	Temporary: Approximately 9,000 s.f. of full depth pavement construction and 41,000 s.f. of temporary pavement, pavement markings and signs  Permanent: Approximately 55,000 s.f. of full depth pavement construction, drainage, pavement markings and signing	Signing
Cost for Improvements	\$450,000 (Temporary) \$700,000 (Permanent)	\$1,000

## 6.0 Shuttle Bus Requirements

Shuttle buses would provide service between downtown and the proposed satellite parking lot at Two Fairgrounds Roads. The following sections summarize the estimated ridership on the route, the proposed route and stop locations, the suggested schedule of bus routes (daily schedule and headways) and the number of vehicles required to run the service.

### 6.1 Bus Route and Stops

The proposed shuttle bus route and stops, shown on Figure 6, are based on recommendations from the NP&EDC and NRTA. Bus stops are proposed at the following locations:

- Two Fairgrounds Road
- Candle Street, just south of Straight Wharf (accommodating Hy-Line passengers)
- Steamboat Wharf at the SSA staging area
- West side of Washington Street, just north of Coffin Street (under consideration)

The Two Fairgrounds Road bus stop would be located along the chain link fence just west of the entrance to the parking lot and as shown on Figure 5. The shuttle bus door would face the chain link fence and not the parking lot travel way. In this manner, passengers waiting to board the bus will be protected from vehicles circulating in the parking lot.

The proposed bus stop at Candle Street would be located on the east side of the street, between Salem Street (southerly Wilkes Square parking lot driveway) and the middle Wilkes Square parking lot driveway. Candle Street in this area is paved with cobblestones. It is 25 feet wide accommodating one northbound travel lane and parking on its west side. Between Salem Street and Straight Wharf there are three 30 minute parking spaces and three taxi spaces. The taxi spaces are north of the 30 minute spaces. The easterly sidewalk is constructed with bricks, is five feet wide and is edged by a granite curb at the street and by a raised landscaped island along its backside. The landscaped island separates the sidewalk from the Winthrop/NIR parking lot.

To accommodate the wheelchair ramp which will extend from the shuttle bus, the sidewalk must have a six foot width which includes four feet for the ramp and two foot of clearance. As the Candle Street sidewalk is only five feet wide it will be necessary to widen the sidewalk by one foot to provide a full six feet in the area of the bus stop. The widening would be for a distance of approximately 20 feet. The cost associated with this widening is approximately \$30,000.

It is also suggested that the three existing 30 minute parking spaces located on the west side of Candle Street may need to be eliminated. The shuttle bus will use approximately 9 feet of the 25 foot wide road and the remaining 16 feet will not be sufficient for a parking lane and a through traffic lane unless Candle Street is widened. Widening of Candle Street may require property impacts.

An alternative location for the Candle Street stop was considered, which was slightly to the north between Still Dock and Old North Wharf. However, the sidewalk at that location is only four feet wide in this area and abuts buildings along its backside. Moreover, Candle Street is only 19 feet wide in this area. An eight foot wide bus parked approximately one foot from the curb would impede traffic circulation. Thus, the physical constraints of this location make it less attractive than a stop adjacent to the Winthrop/NIR parking lot.

## **6.2 Roundtrip Time**

The total roundtrip trip between Two Fairgrounds Road and downtown Nantucket includes both travel time and loading/unloading time at the bus stops. In July and August 2009 the travel times between each proposed bus stop was measured during low, medium and high traffic level time periods (8:00 a.m., 10:00 a.m. and 12:00 p.m.). These measurements indicated that the total

round-trip travel time is approximately 15 minutes during low traffic periods, 17 minutes during medium traffic levels and 24 minutes during high traffic periods. It is estimated that the time to load and unload passengers at each of the proposed four bus stops totals approximately 23 minutes. Detailed loading/unloading times for each proposed stop were roughly estimated by the NRTA for purposes of this analysis. Table 6 provides details for the timing of the proposed shuttle bus route during periods of low, medium and high traffic levels.

**Table 6 Shuttle Bus Route Travel and Stopped Times**

Two Fairgrounds Road to Downtown	Traffic Levels		
	Low	Medium	High
Loading Time: Two Fairgrounds Road Parking Lot	5 min.	5 min.	5 min.
Travel Time: Two Fairgrounds Parking Lot to Candle Street Stop	6 min.	6 min.	10 min.
Loading Time: Candle Street Stop	5 min.	5 min.	5 min.
Travel Time: Candle Street Stop to Steamboat Wharf Stop	2 min.	2 min.	4 min.
Loading Time: Steamboat Wharf Stop	8 min.	8 min.	8 min.
Travel Time: Steamboat Wharf Stop to Washington Street Stop	3 min.	3 min.	4 min.
Loading Time: Washington Street Stop	5 min.	5 min.	5 min.
Travel Time: Washington Street Stop to Two Fairgrounds Parking Lot	4 min.	6 min.	6 min.
<b>Total</b>	<b>38 min.</b>	<b>40 min.</b>	<b>47 min.</b>

### 6.3 Schedule

Based on the 2008 SSA and HL passenger data and recommendations from the NP&EDC, it is recommended that the satellite parking lot and shuttle bus be fully operational from approximately the third week in June (June 20<sup>th</sup>) through Labor Day (September 6<sup>th</sup>) or for a period of approximately 79 days. Service is also suggested for the shoulder months (April 20<sup>th</sup> to June 19<sup>th</sup> and September 7<sup>th</sup> to October 26<sup>th</sup> or 111 days). Service could be reduced during this period to save costs as the demand for the shuttle bus is estimated to be half of the expected summer demand. Throughout the summer and shoulder seasons it is recommended that the shuttle bus service between the satellite parking lot at Two Fairgrounds Road and downtown be provided seven days a week from 5:30 a.m. to 11:00 p.m. accommodating all ferries. The more consistent and easy to remember the shuttle bus schedule is, the more likely a resident will be to use the system.

An analysis of the 2009 SSA and Hy-Line summer ferry schedules was performed to see if a consistent interval occurs between ferries throughout the day which the shuttle bus could match. That analysis, summarized in Table 7, indicates that the interval between ferries varies throughout the day which makes it difficult to set a pre-timed schedule that makes sense (and is easy for passengers to remember). Thus, it is recommended that the shuttle bus run with a consistent headway of 15 minutes. Again, this easy to remember interval will facilitate the use of the park and ride system.

**Table 7 2009 Ferry Schedule (June 24 to September 10)**

<b>Activity</b>	<b>Time</b>	<b>Time Between Ferries</b>
SSA Slow Ferry Departs	6:30 AM	
Hy-Line Ferry Arrives	7:30 AM	1:00
Hy-Line Ferry Departs	7:45 AM	0:15
SSA Fast Ferry Arrives	9:00 AM	1:15
SSA Fast Ferry Departs	9:30 AM	0:30
SSA Slow Ferry Arrives	9:45 AM	0:15
Hy-Line Ferry Arrives	10:10 AM	0:25
SSA Slow Ferry Departs	10:15 AM	0:05
Hy-Line Ferry Departs	10:35 AM	0:20
Hy-Line Slow Ferry Arrives	11:10 AM	0:35
Hy-Line Slow Ferry Departs	11:25 AM	0:15
SSA Slow Ferry Arrives	11:30 AM	0:05
SSA Slow Ferry Departs	12:00 PM	0:30
SSA Fast Ferry Arrives	12:00 PM	0:00
SSA Fast Ferry Departs	12:30 PM	0:30
Hy-Line Ferry Arrives	1:00 PM	0:30
Hy-Line Ferry Departs	1:25 PM	0:25
SSA Fast Ferry Arrives	2:55 PM	1:30
SSA Fast Ferry Departs	3:15 PM	0:20
SSA Slow Ferry Arrives	3:15 PM	0:00
Hy-Line Slow Ferry Arrives	3:25 PM	0:10
SSA Slow Ferry Departs	3:45 PM	0:20
Hy-Line Slow Ferry Departs	4:10 PM	0:25
Hy-Line Ferry Arrives	4:15 PM	0:30
Hy-Line Ferry Departs	4:35 PM	0:20
SSA Slow Ferry Arrives	5:00 PM	0:25
SSA Slow Ferry Departs	5:30 PM	0:30
SSA Fast Ferry Arrives	5:30 PM	0:00
SSA Fast Ferry Departs	6:00 PM	0:30
Hy-Line Ferry Arrives	7:00 PM	1:00
Hy-Line Ferry Departs	7:20 PM	0:20
Hy-Line Slow Ferry Arrives	8:10 PM	0:50
SSA Fast Ferry Arrives	8:15 PM	0:05
Hy-Line Slow Ferry Departs	8:20 PM	0:05
SSA Fast Ferry Departs	8:30 PM	0:10
SSA Slow Ferry Arrives	8:45 PM	0:15
SSA Slow Ferry Departs	9:00 PM	0:15
Hy-Line Ferry Arrives	9:45 PM	0:45
Hy-Line Ferry Departs	10:00 PM	0:15
SSA Slow Ferry Arrives	10:15 PM	0:15

The 15 minute headway could also be maintained though the shoulder months to encourage use or perhaps reduced to 30 minutes to reduce costs. This is a decision the NRTA would need to make based on actual usage during these months. It is noted that the Vineyard Transit Authority Tisbury Park and Ride shuttle bus operates through out the year and maintains consistent 15 minute headway.

## **6.4 Required Number of Buses**

The number of buses required to provide a headway of 15 minutes is dependent on the number of seats provided on each bus and the number of passengers each bus will be expected to carry. The peak summer weekday and Saturday ferry passenger volumes arriving and departing every 15 minutes were adjusted to estimate potential users of the Park and Ride system. These adjustments included a reduction of 62 percent to account for passengers currently using alternative modes to travel to/from the wharfs, a reduction of 75 percent to account for the number of passengers arriving/departing by car willing use a park and ride operation and then an increase of 25 percent to account for potential passengers using the operation who are not ferry passengers. The estimated bus passenger volumes were divided by an assumed bus capacity (26 – 16 seats and 10 standees) to determine the number of buses required to carry passengers from the wharfs to the parking lot (arriving passengers) and from the parking lot to the wharf (departing passengers) for each hour. This analysis, contained in Appendix D, indicates that one bus arriving every 15 minutes, with a passenger capacity of 26 passengers (estimated), should be able to accommodate all passengers on both a weekday and a weekend with very few passengers required to wait for a second bus.

As the roundtrip including travel time and loading time ranges from 38 to 47 minutes, four buses will be required to provide a headway of 15 minutes during heavy traffic periods. A fifth bus would be desirable to accommodate spikes in usage and as a replacement bus when buses are taken out of service for repairs or maintenance. However, to keep capital and operations costs as low as possible, it is suggested that only four buses be dedicated to the park and ride operation.

## **6.5 Shuttle Bus Vehicle Specifications and Options**

The NRTA has requested that the shuttle bus meet the following requirements:

- 30 feet length maximum
- 96 inch width maximum
- Space to accommodate two wheelchairs
- Handicapped Accessible
- Luggage Rack
- Bicycle Rack

NRTA suggested that both diesel and diesel hybrid buses manufactured by the International Corporation and ElDorado National be considered. Bus dealerships were contacted to determine what models of each of these manufactures would meet the above specifications. Dattco, Inc of New Britain, CT recently sold the NRTA an International Corporation HC model which meets all of the above requirements. Northern Bus Sales of Hudson, NH carries the ElDorado National AeroElite and Aerotech models. Table 8 provides a summary of six vehicles which meet the specifications of the NRTA and provide sufficient passenger capacity for the parking and ride operation.

**Table 8 Shuttle Bus Model Comparison**

	<b>International Corporation: HC - Diesel</b>	<b>International Corporation: HC – Hybrid</b>	<b>EIDorado National: Aerotech – Gas</b>	<b>EIDorado National: Aerotech - Hybrid</b>	<b>EIDorado National: Aerotech Elite – Diesel</b>	<b>EIDorado National: Aerotech Elite – Hybrid</b>
Chasse	IC	IC	Ford	Ford	IC	IC
Length	25 feet	25 feet	24 feet	22 feet	29 feet	29 feet
Outside Width	95 inches	95 inches	96 inches	96 inches	96 inches	96 inches
Wheel Base	169 inches	169 inches	176 inches	176 inches	217 inches	217 inches
Number of Regular Seats	16 seats	16 seats	18 seats	12 seats	28 seats	28 seats
Number of Wheelchair Spaces	2 spaces for wheelchairs	2 spaces for wheelchairs	2 spaces for wheelchairs	2 spaces for wheelchairs	2 spaces for wheelchairs	2 spaces for wheelchairs
Number of Standees	10 standees	10 standees	0 (weight constrained)	0 (weight constrained)	10 standees	10 standees
Total Capacity	26 passengers	26 passengers	18 passengers	12 passengers	38 passengers	38 passengers
Luggage Rack	Yes – behind driver	Yes – behind driver	Yes – behind driver	Yes – behind driver	Yes – behind driver	Yes – behind driver
Estimated fuel rating	7 mpg to 12 mpg	9 mpg to 16 mpg	12 mpg	16 mpg	10 mpg	13 mpg
Cost*	\$227,000	\$292,000	\$168,000	\$248,000	\$188,000	\$258,000

Notes: Costs include dealer fees, but not registration or inspection. The NRTA is exempt from sales taxes.

The hybrid vehicles are significantly more expensive than the non-hybrid vehicle (\$65,000 to \$80,000), but are estimated by bus manufactures to reduce fuel consumption by 30 percent. It is estimated that a typical diesel vehicle will utilize approximately \$17.50 of fuel a day. This is based on an estimated daily mileage of 52.5 miles a day per vehicle (3 miles per trip x 17.5 trips a day), an estimated fuel cost of \$4 per gallon and a fuel rating of approximately 12 mpg. Thus, if a hybrid was utilized for the same daily activity, a decrease of 30 percent would generate a savings of approximately \$5.25 per day per vehicle. The NP&EDC and NRTA will need to decide if the higher initial capital cost of a hybrid vehicle is more cost effective in the long-term because of operational cost savings.

As of September 2009, no funding was available through the state of Massachusetts to reduce the cost of hybrid buses. However, two programs which have been offered in the past through the federal government to off set the incremental difference between a hybrid and non-hybrid vehicle include the EPA National Clean Diesel Program and the Department of Energy Clean Cities Program (administered by individual states). The EPA National Clean Diesel Program offered in 2009 paid up to 25% of the total vehicle cost (body and chassis) of a hybrid bus. It is unknown if this program will be offered again in 2010, however it suggested that the NRTA check the program's website at regular intervals ([www.epa.gov/otaq/diesel/prgnational.htm](http://www.epa.gov/otaq/diesel/prgnational.htm)).

The Department of Energy Clean Cities Program has typically funded up to 80% of the incremental cost of a hybrid system. The town would need to work with Massachusetts Clean

Cities Coalition office to apply. Their website is imbedded in the state website (<http://www.mass.gov> -search for Alternative Vehicle Grant Programs).

Lastly, a tax rebate may be available through the bus dealership. As the town and/or NRTA are exempt, the dealership would apply for the rebate through the Internal Revenue Service and then passes the tax credit onto the town and/or NRTA. These rebates are typically \$3,000 to \$6,000.

As the NRTA has purchased the International Corporation HC diesel vehicle in the past, it is assumed for the cost analyses that follow that the NRTA will select this vehicle, or its hybrid version, for the Park and Ride operation.

## 7.0 Park and Ride Cost Analysis

### 7.1 Initial Capital

The start up capital costs for the Nantucket Park and Ride system are summarized in Table 9. As seen in Table 9, the estimated start up costs for the Park and Ride system range from approximately \$1,404,500, assuming International Corporation diesel buses, to \$1,664,500 assuming International Corporation hybrid buses.

**Table 9 Summary of Start-Up Costs**

Description	Cost (Diesel Vehicles)	Cost (Hybrid Vehicles)
• Temporary upgrade to Two Fairgrounds Road to accommodate satellite parking	\$450,000	\$450,000
• Modify the Candle Street sidewalk to accommodate access/egress of handicapped persons requiring a ramp to/from the shuttle bus	\$30,000	\$30,000
• Install bus stop signs at five locations	\$15,000	\$15,000
• Install directional signs to Two Fairgrounds Road	\$1,500	\$1,500
• Purchase four shuttle buses*	\$908,000	\$1,168,000
Total	\$1,404,500	\$1,664,500

\*A fifth bus is desirable to accommodate peaks in ridership and as a replacement for buses taken out of service for maintenance.

### 7.2 Annual Operating Costs

The cost to operate four non-hybrid shuttle buses during the peak summer period from June 20<sup>th</sup> to September 6<sup>th</sup> is estimated at \$427,000. The additional cost to operate three shuttle buses for the shoulder periods (April 20<sup>th</sup> to June 19<sup>th</sup> and September 7<sup>th</sup> to October 26<sup>th</sup>) is estimated at \$493,000. This is based upon:

- June 20 to Sept 6 (79-day operational period)
  - Three buses operating continuously from 5:30 a.m. to 11:00 p.m. providing service every 15 minutes.
  - One additional bus operating continuously from 9:00 a.m. to 8:00 p.m.

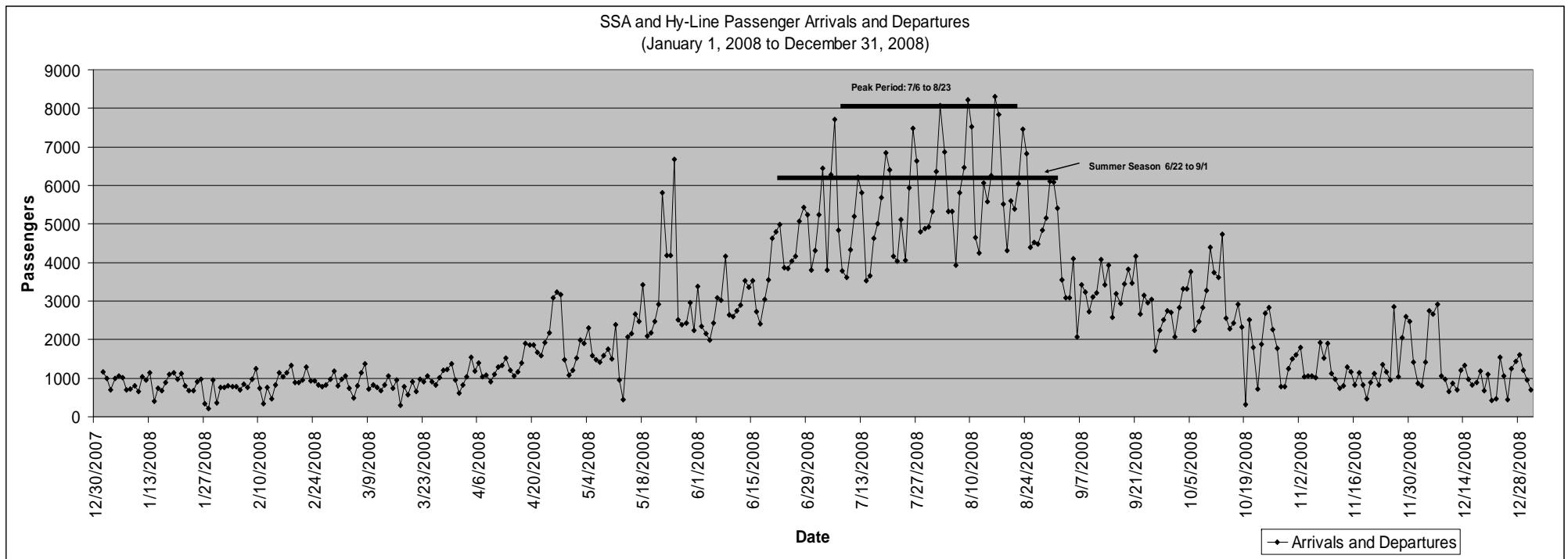
- April 20<sup>th</sup> to June 19<sup>th</sup> and September 2<sup>nd</sup> to October 26<sup>th</sup> (111-day operational period)
  - Three buses operating continuously from 5:30 a.m. to 11:00 p.m. providing service every 15 minutes
- \$80 per hour per bus which includes the driver, fuel, bus maintenance and insurance

In summary, the total annual operating expense is estimated at \$919,500.

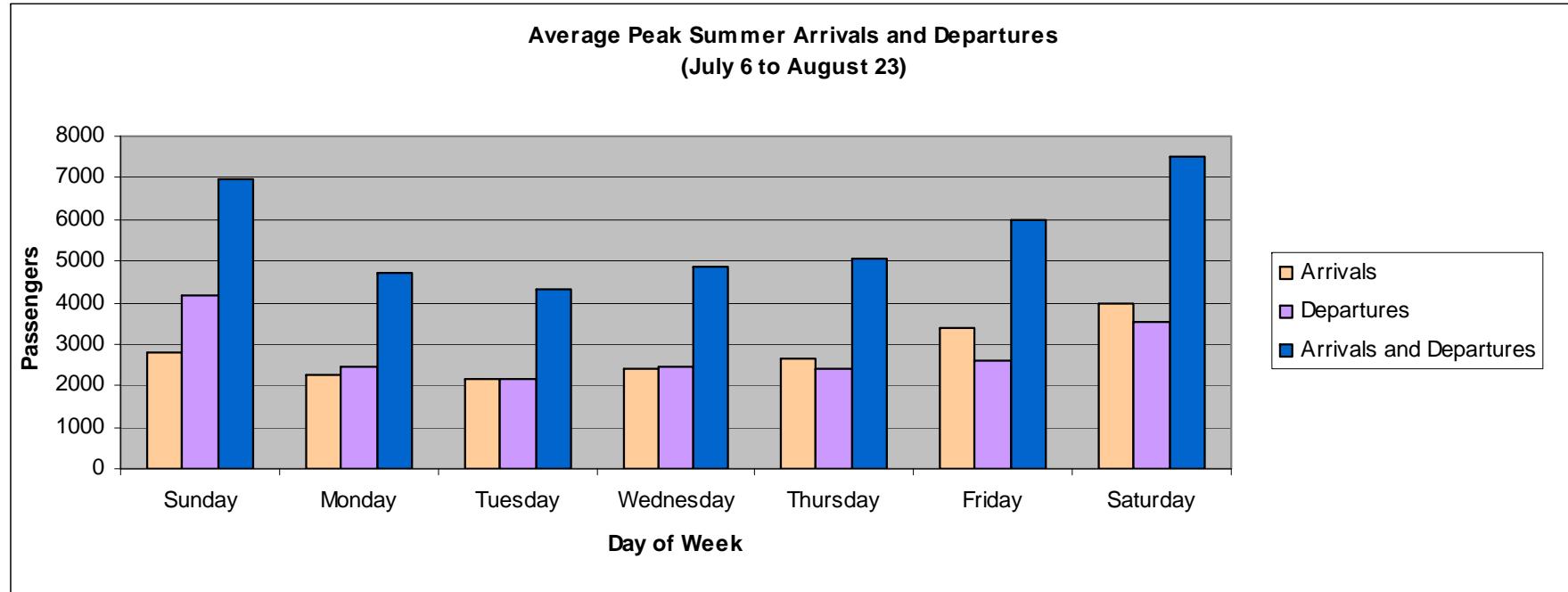
It is estimated that the shuttle buses will carry approximately 53,325 passengers during the peak summer period and 35,885 passengers during the shoulder season. Thus, applying the operational costs presented above (\$427,600 for the summer period and \$493,000 for the shoulder season), the estimated cost per ride is \$8.00 during the summer, \$13.73 during the shoulder season. It is suggested that the NRTA may want to consider charging either for parking at Two Fairgrounds Road or per ride to recuperate some of the operational costs.

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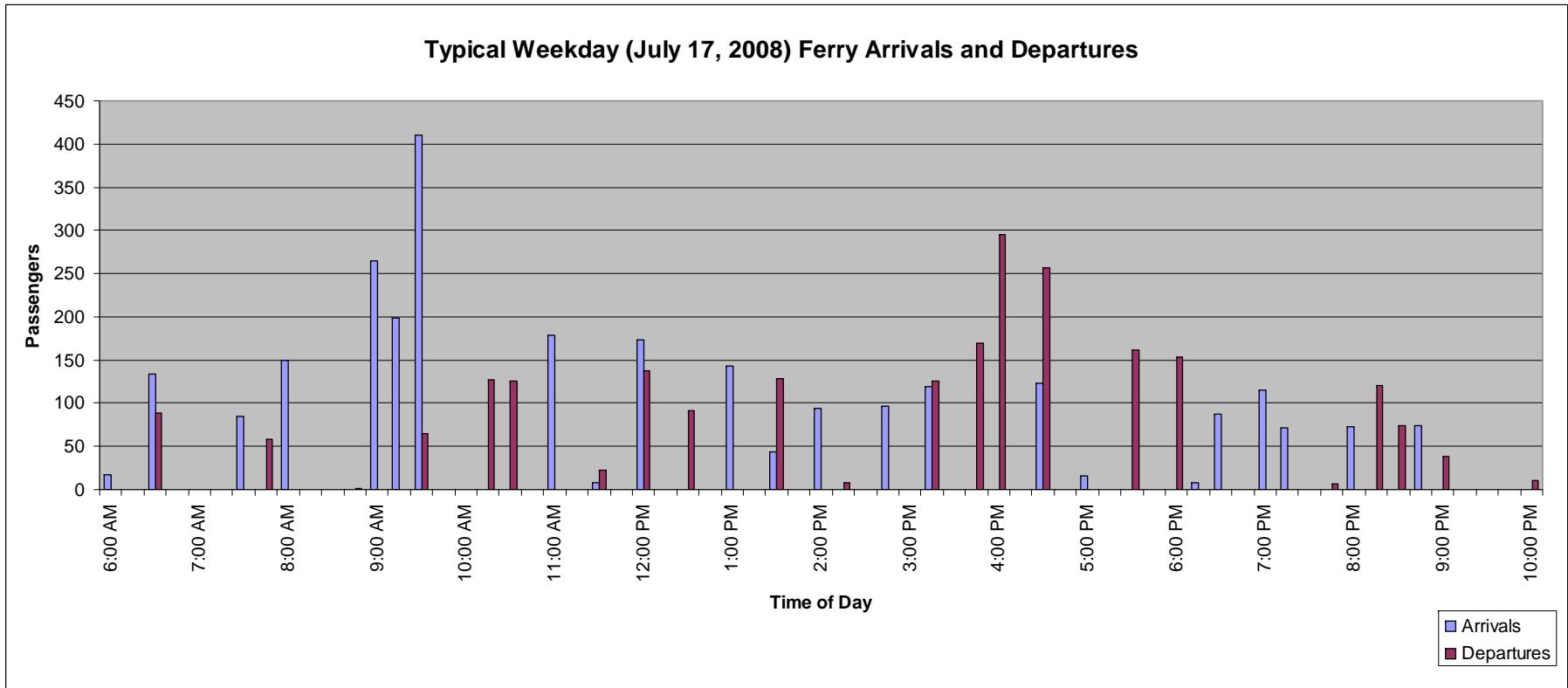
# **FIGURES**



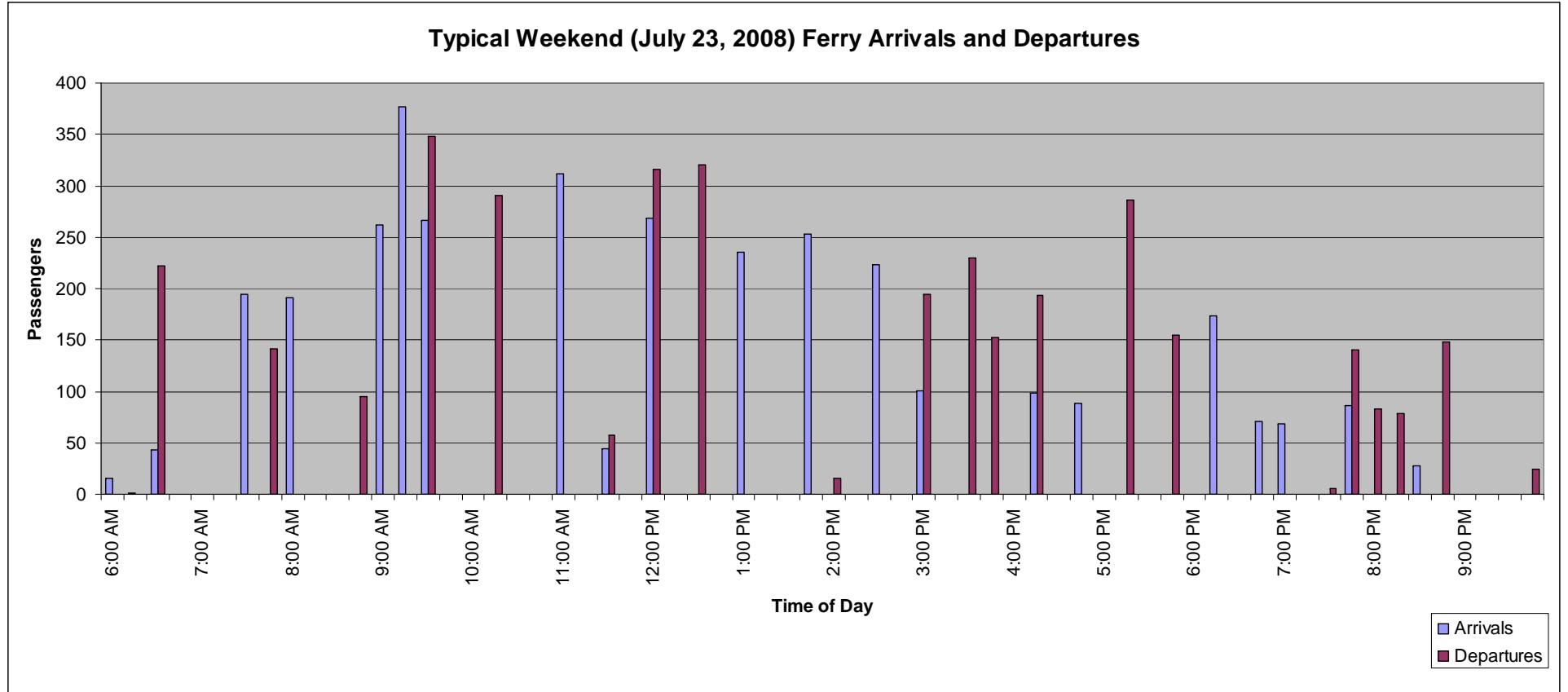
**Figure 1 2008 Steamship and Hy-Line Daily Passengers**



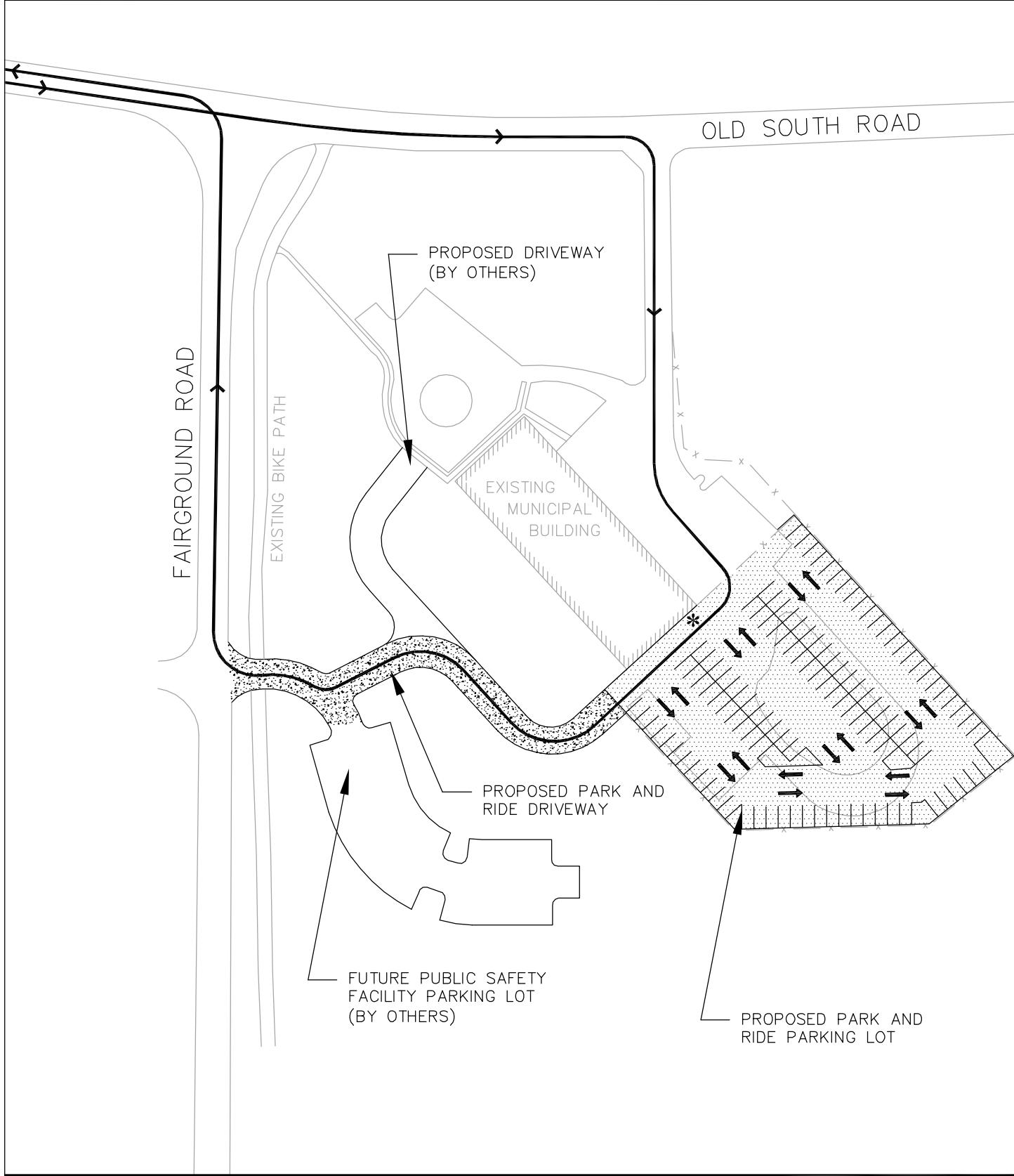
**Figure 2 2008 Peak Summer SSA and Hy-Line Passengers by Day of Week**



**Figure 3 2008 Peak Summer Weekday Arrivals and Departures by Quarter Hour**



**Figure 4 2008 Peak Summer Weekend Day Arrivals and Departures by Quarter Hour**



1000  
0 250 500 1000  
Approximate Scale

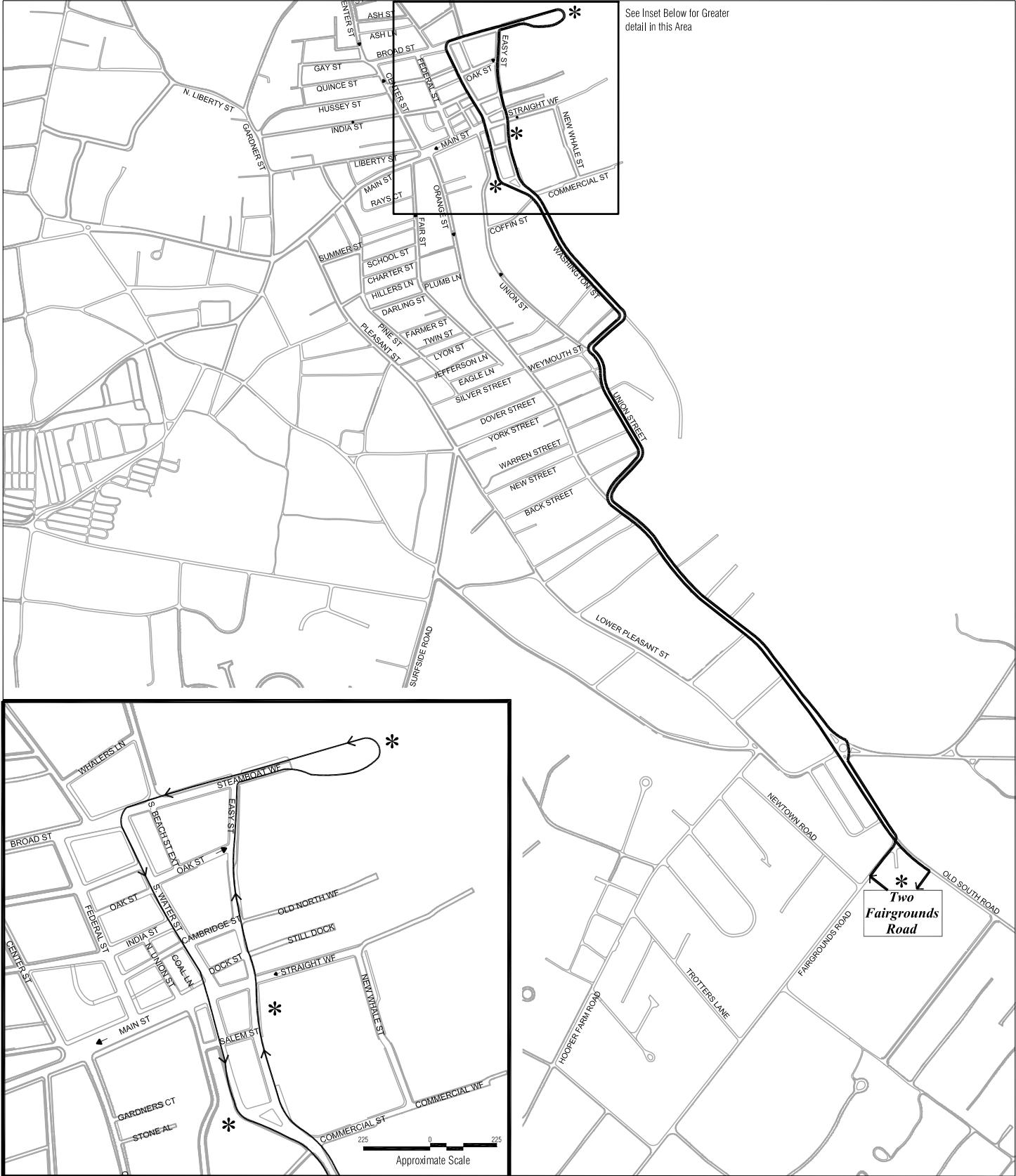
**TETRA TECH RIZZO**

Legend	
Existing Pavement	
Full Depth Pavement	
Short Term (Temp) Pavement	
Existing Chain Link Fence	
Shuttle Bus Route	
Shuttle Bus Stop	

Nantucket Park and Ride Operation  
Nantucket, Massachusetts

Conceptual Plan  
Two Fairgrounds  
Parking Lot

Figure 5



1000 0 250 500 1000

Approximate Scale



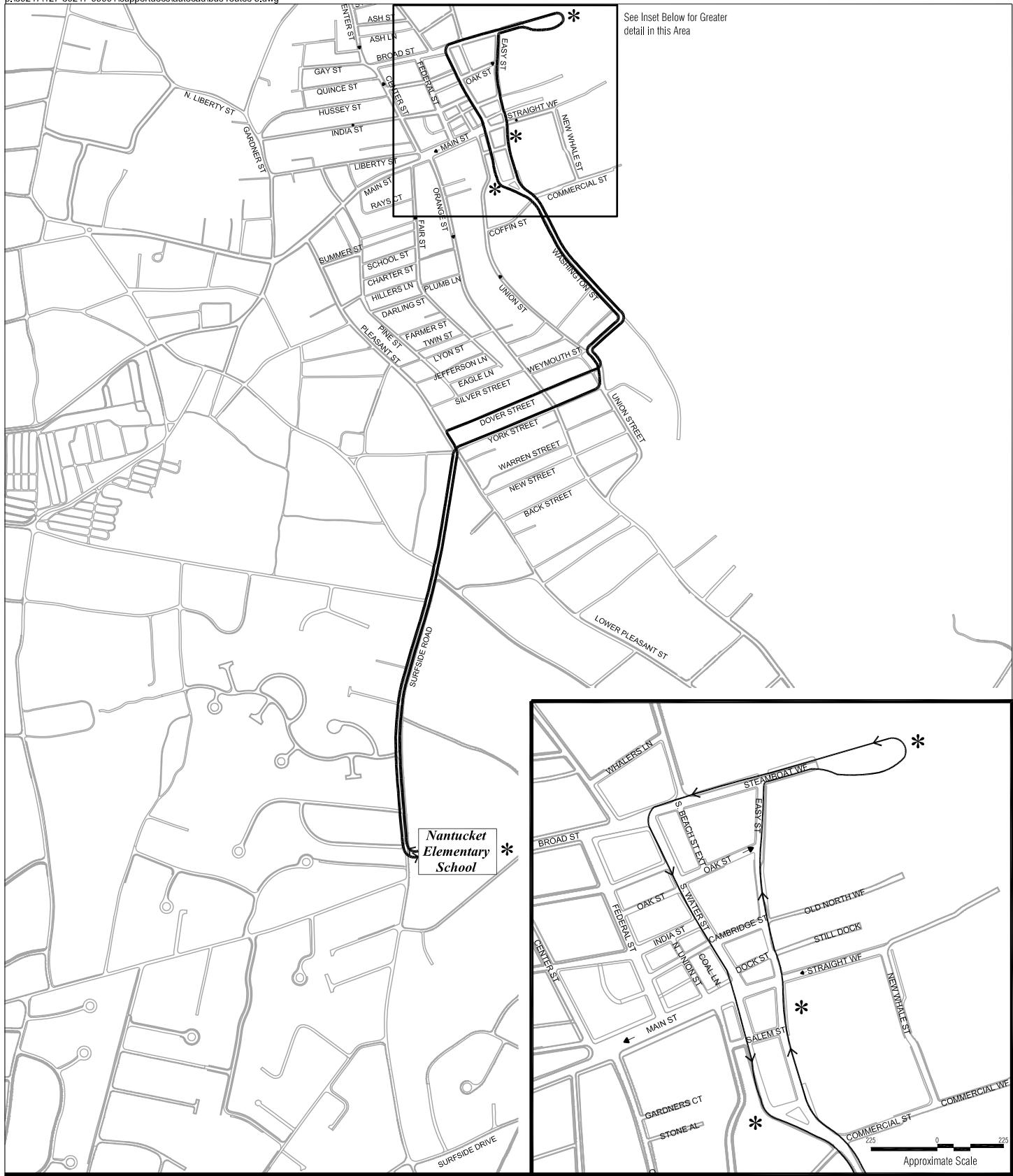
Nantucket Park and Ride Operation  
Nantucket, Massachusetts

Shuttle Bus Route-  
Two Fairgrounds  
Road to Downtown



**TETRA TECH RIZZO**

Figure 6



1000 0 250 500 1000

Approximate Scale



Nantucket Park and Ride Operation  
Nantucket, Massachusetts

Shuttle Bus Route-  
Nantucket Elementary  
School to Downtown

Figure 7



TETRA TECH RIZZO

**Appendix A**  
**Steamship Authority and Hy-Line Passenger Data**

**SSA and Hy-Line Passenger Data (January 1 to December 31, 2008)**

Date	Day	Arrivals	Departures	Total
1/1/2008	Tues	475	692	1167
1/2/2008	Wed	599	391	990
1/3/2008	Thurs	422	281	703
1/4/2008	Fri	502	491	993
1/5/2008	Sat	530	536	1066
1/6/2008	Sun	537	470	1007
1/7/2008	Mon	383	323	706
1/8/2008	Tues	369	343	712
1/9/2008	Wed	408	400	808
1/10/2008	Thurs	340	324	664
1/11/2008	Fri	500	531	1031
1/12/2008	Sat	444	509	953
1/13/2008	Sun	559	585	1144
1/14/2008	Mon	232	164	396
1/15/2008	Tues	377	370	747
1/16/2008	Wed	311	365	676
1/17/2008	Thurs	336	542	878
1/18/2008	Fri	494	602	1096
1/19/2008	Sat	510	635	1145
1/20/2008	Sun	537	445	982
1/21/2008	Mon	661	466	1127
1/22/2008	Tues	436	366	802
1/23/2008	Wed	324	360	684
1/24/2008	Thurs	322	362	684
1/25/2008	Fri	403	501	904
1/26/2008	Sat	463	514	977
1/27/2008	Sun	49	296	345
1/28/2008	Mon	196	23	219
1/29/2008	Tues	591	362	953
1/30/2008	Wed	193	166	359
1/31/2008	Thurs	341	421	762
2/1/2008	Fri	265	503	768
2/2/2008	Sat	428	379	807
2/3/2008	Sun	463	315	778
2/4/2008	Mon	456	333	789
2/5/2008	Tues	383	314	697
2/6/2008	Wed	439	398	837
2/7/2008	Thurs	364	392	756
2/8/2008	Fri	409	556	965
2/9/2008	Sat	568	669	1237
2/10/2008	Sun	344	388	732
2/11/2008	Mon	221	116	337
2/12/2008	Tues	431	322	753
2/13/2008	Wed	233	238	471
2/14/2008	Thurs	350	483	833
2/15/2008	Fri	507	624	1131
2/16/2008	Sat	560	482	1042
2/17/2008	Sun	658	476	1134
2/18/2008	Mon	716	621	1337
2/19/2008	Tues	447	432	879
2/20/2008	Wed	372	517	889
2/21/2008	Thurs	401	559	960

Winter

**SSA and Hy-Line Passenger Data (January 1 to December 31, 2008)**

Date	Day	Arrivals	Departures	Total
2/22/2008	Fri	294	994	1288
2/23/2008	Sat	308	617	925
2/24/2008	Sun	456	474	930
2/25/2008	Mon	440	391	831
2/26/2008	Tues	370	420	790
2/27/2008	Wed	386	438	824
2/28/2008	Thurs	447	533	980
2/29/2008	Fri	535	639	1174
3/1/2008	Sat	479	317	796
3/2/2008	Sun	715	247	962
3/3/2008	Mon	666	396	1062
3/4/2008	Tues	409	320	729
3/5/2008	Wed	244	233	477
3/6/2008	Thurs	394	412	806
3/7/2008	Fri	573	563	1136
3/8/2008	Sat	560	807	1367
3/9/2008	Sun	451	258	709
3/10/2008	Mon	502	314	816
3/11/2008	Tues	431	321	752
3/12/2008	Wed	323	358	681
3/13/2008	Thurs	354	461	815
3/14/2008	Fri	471	575	1046
3/15/2008	Sat	269	467	736
3/16/2008	Sun	552	404	956
3/17/2008	Mon	159	134	293
3/18/2008	Tues	491	299	790
3/19/2008	Wed	268	293	561
3/20/2008	Thurs	398	501	899
3/21/2008	Fri	342	311	653
3/22/2008	Sat	483	495	978
3/23/2008	Sun	409	492	901
3/24/2008	Mon	618	432	1050
3/25/2008	Tues	503	408	911
3/26/2008	Wed	422	397	819
3/27/2008	Thurs	442	573	1015
3/28/2008	Fri	548	652	1200
3/29/2008	Sat	596	630	1226
3/30/2008	Sun	718	647	1365
3/31/2008	Mon	529	412	941
4/1/2008	Tues	357	265	622
4/2/2008	Wed	422	405	827
4/3/2008	Thurs	490	549	1039
4/4/2008	Fri	648	904	1552
4/5/2008	Sat	578	598	1176
4/6/2008	Sun	748	651	1399
4/7/2008	Mon	603	423	1026
4/8/2008	Tues	559	528	1087
4/9/2008	Wed	482	427	909
4/10/2008	Thurs	533	561	1094
4/11/2008	Fri	619	680	1299
4/12/2008	Sat	692	645	1337
4/13/2008	Sun	789	728	1517
4/14/2008	Mon	718	485	1203
4/15/2008	Tues	567	486	1053
4/16/2008	Wed	568	595	1163
4/17/2008	Thurs	656	733	1389
4/18/2008	Fri	1012	883	1895
4/19/2008	Sat	965	889	1854

**SSA and Hy-Line Passenger Data (January 1 to December 31, 2008)**

Date	Day	Arrivals	Departures	Total
4/20/2008	Sun	835	1028	1863
4/21/2008	Mon	905	759	1664
4/22/2008	Tues	882	698	1580
4/23/2008	Wed	1126	803	1929
4/24/2008	Thurs	1265	906	2171
4/25/2008	Fri	2220	859	3079
4/26/2008	Sat	1684	1555	3239
4/27/2008	Sun	753	2408	3161
4/28/2008	Mon	666	817	1483
4/29/2008	Tues	478	601	1079
4/30/2008	Wed	603	602	1205
5/1/2008	Thurs	857	666	1523
5/2/2008	Fri	1131	865	1996
5/3/2008	Sat	971	939	1910
5/4/2008	Sun	985	1309	2294
5/5/2008	Mon	926	655	1581
5/6/2008	Tues	774	706	1480
5/7/2008	Wed	689	717	1406
5/8/2008	Thurs	822	766	1588
5/9/2008	Fri	976	772	1748
5/10/2008	Sat	875	633	1508
5/11/2008	Sun	1080	1314	2394
5/12/2008	Mon	571	377	948
5/13/2008	Tues	263	189	452
5/14/2008	Wed	1166	900	2066
5/15/2008	Thurs	1312	847	2159
5/16/2008	Fri	1679	981	2660
5/17/2008	Sat	1403	1063	2466
5/18/2008	Sun	1263	2164	3427
5/19/2008	Mon	1087	1005	2092
5/20/2008	Tues	1167	1012	2179 Shoulder
5/21/2008	Wed	1385	1085	2470 Season
5/22/2008	Thurs	1854	1058	2912
5/23/2008	Fri	4666	1144	5810
5/24/2008	Sat	2873	1311	4184
5/25/2008	Sun	1829	2361	4190
5/26/2008	Mon	1102	5582	6684
5/27/2008	Tues	964	1546	2510
5/28/2008	Wed	1184	1202	2386
5/29/2008	Thurs	1317	1120	2437
5/30/2008	Fri	1683	1274	2957
5/31/2008	Sat	1173	1071	2244
6/1/2008	Sun	1516	1859	3375
6/2/2008	Mon	1200	1154	2354
6/3/2008	Tues	1209	952	2161
6/4/2008	Wed	967	1026	1993
6/5/2008	Thurs	1406	1014	2420
6/6/2008	Fri	1955	1126	3081
6/7/2008	Sat	1743	1273	3016
6/8/2008	Sun	1730	2427	4157
6/9/2008	Mon	1410	1225	2635
6/10/2008	Tues	1381	1221	2602
6/11/2008	Wed	1360	1379	2739
6/12/2008	Thurs	1581	1318	2899
6/13/2008	Fri	2134	1392	3526
6/14/2008	Sat	1949	1402	3351
6/15/2008	Sun	1489	2044	3533
6/16/2008	Mon	1570	1164	2734
6/17/2008	Tues	1367	1032	2399
6/18/2008	Wed	1701	1333	3034
6/19/2008	Thurs	2123	1428	3551

### **SSA and Hy-Line Passenger Data (January 1 to December 31, 2008)**

Date	Day	Arrivals	Departures	Total
6/20/2008	Fri	2958	1678	4636
6/21/2008	Sat	2949	1856	4805
6/22/2008	Sun	1996	2999	4995
6/23/2008	Mon	2057	1811	3868
6/24/2008	Tues	2061	1788	3849
6/25/2008	Wed	2250	1779	4029
6/26/2008	Thurs	2295	1876	4171
6/27/2008	Fri	2904	2169	5073
6/28/2008	Sat	3032	2407	5439
6/29/2008	Sun	2468	2761	5229
6/30/2008	Mon	2148	1662	3810
7/1/2008	Tues	2578	1727	4305
7/2/2008	Wed	3231	2005	5236
7/3/2008	Thurs	4524	1917	6441
7/4/2008	Fri	2607	1190	3797
7/5/2008	Sat	2600	3678	6278
7/6/2008	Sun	2097	5621	7718
7/7/2008	Mon	2017	2816	4833
7/8/2008	Tues	1894	1886	3780
7/9/2008	Wed	1868	1745	3613
7/10/2008	Thurs	2278	2048	4326
7/11/2008	Fri	2976	2227	5203
7/12/2008	Sat	3260	2950	6210
7/13/2008	Sun	2321	3497	5818
7/14/2008	Mon	1756	1767	3523
7/15/2008	Tues	1843	1813	3656
7/16/2008	Wed	2328	2300	4628
7/17/2008	Thurs	2684	2315	4999
7/18/2008	Fri	3341	2343	5684
7/19/2008	Sat	3807	3042	6849
7/20/2008	Sun	2711	3693	6404
7/21/2008	Mon	2108	2064	4172
7/22/2008	Tues	2066	1974	4040
7/23/2008	Wed	2647	2458	5105
7/24/2008	Thurs	2194	1872	4066
7/25/2008	Fri	3446	2492	5938
7/26/2008	Sat	4180	3308	7488
7/27/2008	Sun	2689	3935	6624
7/28/2008	Mon	2387	2419	4806
7/29/2008	Tues	2461	2415	4876
7/30/2008	Wed	2494	2434	4928
7/31/2008	Thurs	2860	2470	5330 Peak Summer
8/1/2008	Fri	3722	2641	6363
8/2/2008	Sat	4386	3676	8062
8/3/2008	Sun	3166	3709	6875
8/4/2008	Mon	2782	2547	5329
8/5/2008	Tues	2713	2618	5331
8/6/2008	Wed	1899	2025	3924
8/7/2008	Thurs	3179	2628	5807
8/8/2008	Fri	3659	2797	6456
8/9/2008	Sat	4439	3786	8225
8/10/2008	Sun	3255	4273	7528
8/11/2008	Mon	2149	2508	4657
8/12/2008	Tues	2086	2159	4245
8/13/2008	Wed	2964	3091	6055
8/14/2008	Thurs	2757	2820	5577
8/15/2008	Fri	3291	2956	6247
8/16/2008	Sat	4220	4074	8294
8/17/2008	Sun	3411	4430	7841
8/18/2008	Mon	2606	2904	5510
8/19/2008	Tues	1941	2370	4311
8/20/2008	Wed	2565	3027	5592
8/21/2008	Thurs	2648	2741	5389
8/22/2008	Fri	3153	2887	6040
8/23/2008	Sat	3509	3959	7468
8/24/2008	Sun	2566	4266	6832
8/25/2008	Mon	1902	2487	4389
8/26/2008	Tues	2035	2495	4530
8/27/2008	Wed	2134	2336	4470
8/28/2008	Thurs	2343	2485	4828
8/29/2008	Fri	2807	2347	5154
8/30/2008	Sat	3020	3094	6114
8/31/2008	Sun	2234	3841	6075
9/1/2008	Mon	1266	4138	5404

Summer

Summer

**SSA and Hy-Line Passenger Data (January 1 to December 31, 2008)**

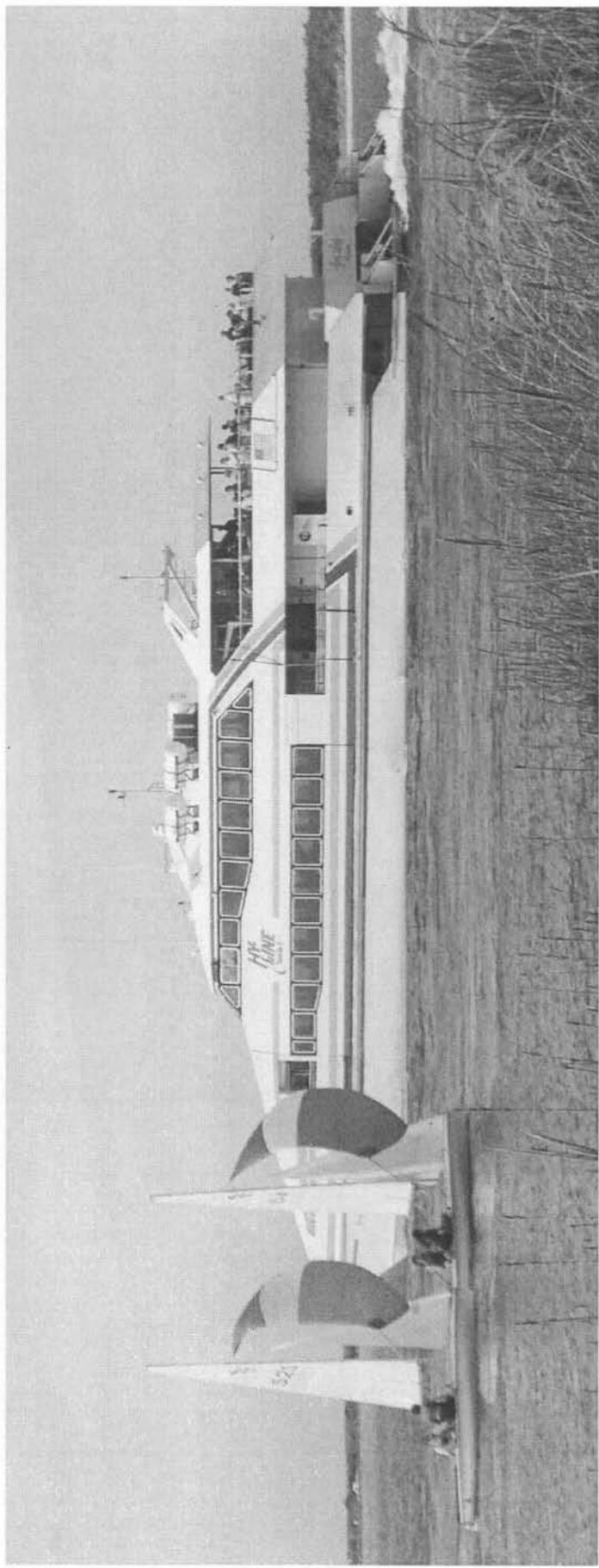
Date	Day	Arrivals	Departures	Total
9/2/2008	Tues	1403	2154	3557
9/3/2008	Wed	1468	1608	3076
9/4/2008	Thurs	1583	1498	3081
9/5/2008	Fri	2323	1784	4107
9/6/2008	Sat	799	1261	2060
9/7/2008	Sun	1259	2157	3416
9/8/2008	Mon	1599	1637	3236
9/9/2008	Tues	1306	1426	2732
9/10/2008	Wed	1546	1558	3104
9/11/2008	Thurs	1681	1521	3202
9/12/2008	Fri	2350	1720	4070
9/13/2008	Sat	1777	1647	3424
9/14/2008	Sun	1240	2691	3931
9/15/2008	Mon	1183	1398	2581
9/16/2008	Tues	1530	1654	3184
9/17/2008	Wed	1437	1509	2946
9/18/2008	Thurs	1827	1620	3447
9/19/2008	Fri	2289	1537	3826
9/20/2008	Sat	1662	1808	3470
9/21/2008	Sun	1364	2801	4165
9/22/2008	Mon	1273	1386	2659
9/23/2008	Tues	1500	1648	3148
9/24/2008	Wed	1435	1519	2954
9/25/2008	Thurs	1493	1551	3044
9/26/2008	Fri	865	840	1705
9/27/2008	Sat	1066	1181	2247
9/28/2008	Sun	960	1561	2521
9/29/2008	Mon	1394	1357	2751
9/30/2008	Tues	1267	1428	2695
10/1/2008	Wed	966	1113	2079
10/2/2008	Thurs	1514	1317	2831
10/3/2008	Fri	2092	1228	3320
10/4/2008	Sat	1676	1649	3325
10/5/2008	Sun	1199	2564	3763
10/6/2008	Mon	1081	1160	2241
10/7/2008	Tues	1225	1249	2474
10/8/2008	Wed	1507	1327	2834
10/9/2008	Thurs	1851	1425	3276
10/10/2008	Fri	2796	1604	4400
10/11/2008	Sat	2320	1409	3729
10/12/2008	Sun	1310	2307	3617
10/13/2008	Mon	1312	3427	4739
10/14/2008	Tues	1084	1481	2565
10/15/2008	Wed	1068	1205	2273
10/16/2008	Thurs	1167	1273	2440
10/17/2008	Fri	1613	1303	2916
10/18/2008	Sat	1234	1091	2325
10/19/2008	Sun	142	173	315
10/20/2008	Mon	980	1535	2515
10/21/2008	Tues	875	929	1804
10/22/2008	Wed	301	420	721
10/23/2008	Thurs	911	978	1889
10/24/2008	Fri	1470	1204	2674
10/25/2008	Sat	1498	1342	2840

**SSA and Hy-Line Passenger Data (January 1 to December 31, 2008)**

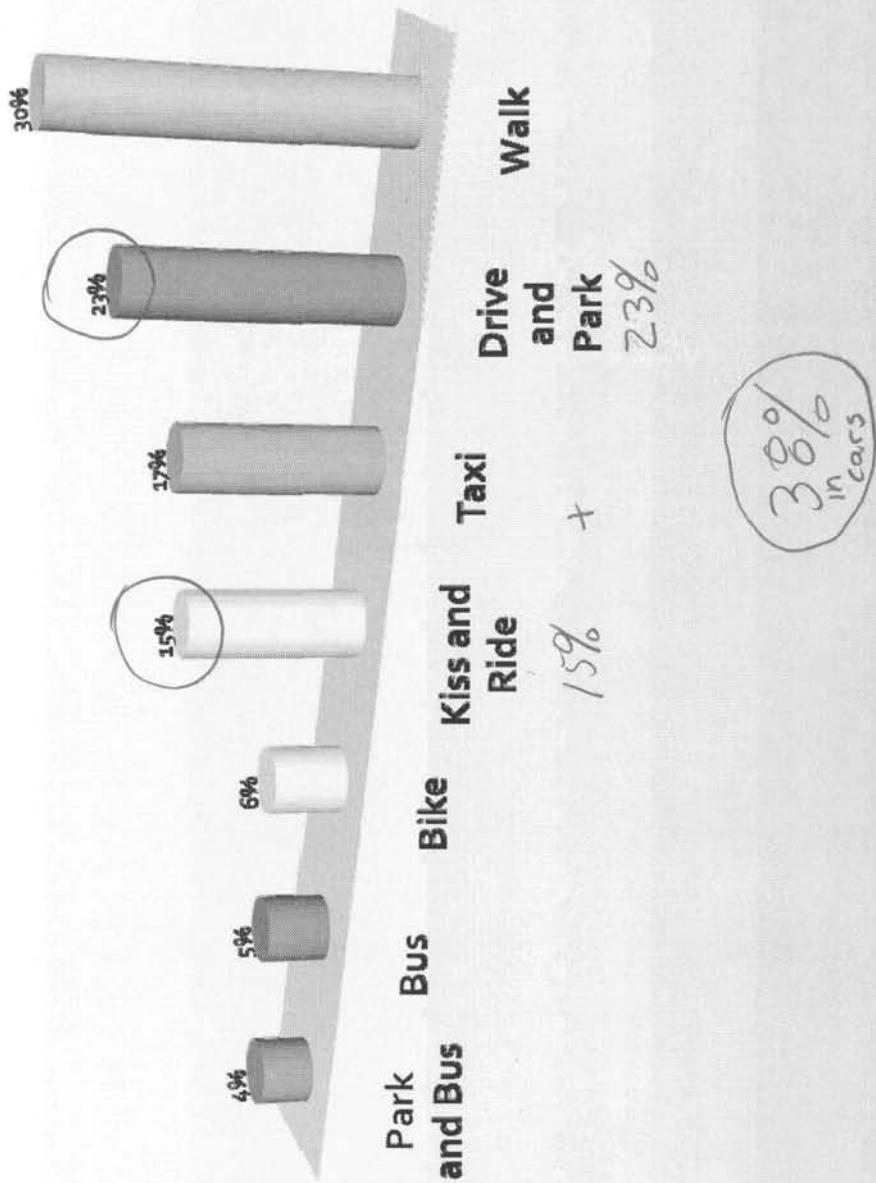
Date	Day	Arrivals	Departures	Total
10/26/2008	Sun	792	1464	2256
10/27/2008	Mon	822	954	1776
10/28/2008	Tues	302	478	780
10/29/2008	Wed	341	432	773
10/30/2008	Thurs	598	653	1251
10/31/2008	Fri	751	740	1491
11/1/2008	Sat	751	864	1615
11/2/2008	Sun	800	992	1792
11/3/2008	Mon	536	495	1031
11/4/2008	Tues	529	533	1062
11/5/2008	Wed	523	537	1060
11/6/2008	Thurs	481	540	1021
11/7/2008	Fri	1085	838	1923
11/8/2008	Sat	740	786	1526
11/9/2008	Sun	685	1207	1892
11/10/2008	Mon	602	511	1113
11/11/2008	Tues	499	479	978
11/12/2008	Wed	362	379	741
11/13/2008	Thurs	390	419	809
11/14/2008	Fri	683	613	1296
11/15/2008	Sat	561	594	1155
11/16/2008	Sun	355	477	832
11/17/2008	Mon	552	588	1140
11/18/2008	Tues	384	434	818
11/19/2008	Wed	227	236	463
11/20/2008	Thurs	409	468	877
11/21/2008	Fri	493	620	1113
11/22/2008	Sat	428	402	830
11/23/2008	Sun	717	630	1347
11/24/2008	Mon	611	551	1162
11/25/2008	Tues	592	368	960
11/26/2008	Wed	1958	895	2853
11/27/2008	Thurs	642	386	1028
11/28/2008	Fri	1155	887	2042
11/29/2008	Sat	857	1752	2609
11/30/2008	Sun	694	1773	2467
12/1/2008	Mon	765	640	1405
12/2/2008	Tues	490	379	869
12/3/2008	Wed	429	371	800
12/4/2008	Thurs	970	445	1415
12/5/2008	Fri	2126	631	2757
12/6/2008	Sat	1403	1249	2652
12/7/2008	Sun	289	2618	2907
12/8/2008	Mon	405	646	1051
12/9/2008	Tues	383	588	971
12/10/2008	Wed	282	370	652
12/11/2008	Thurs	374	483	857
12/12/2008	Fri	310	390	700
12/13/2008	Sat	599	608	1207
12/14/2008	Sun	654	668	1322
12/15/2008	Mon	528	452	980
12/16/2008	Tues	410	408	818
12/17/2008	Wed	374	504	878
12/18/2008	Thurs	473	709	1182
12/19/2008	Fri	240	446	686
12/20/2008	Sat	369	725	1094
12/21/2008	Sun	169	254	423
12/22/2008	Mon	188	281	469
12/23/2008	Tues	664	875	1539
12/24/2008	Wed	488	576	1064
12/25/2008	Thurs	158	287	445
12/26/2008	Fri	647	601	1248
12/27/2008	Sat	684	746	1430
12/28/2008	Sun	883	729	1612
12/29/2008	Mon	660	547	1207
12/30/2008	Tues	496	461	957
12/31/2008	Wed	330	361	691
<b>Total</b>		<b>449051</b>	<b>449980</b>	<b>899031</b>

**Appendix B**  
**ReMain Ferry Passenger Survey Data**

## Survey of Ferry Riders

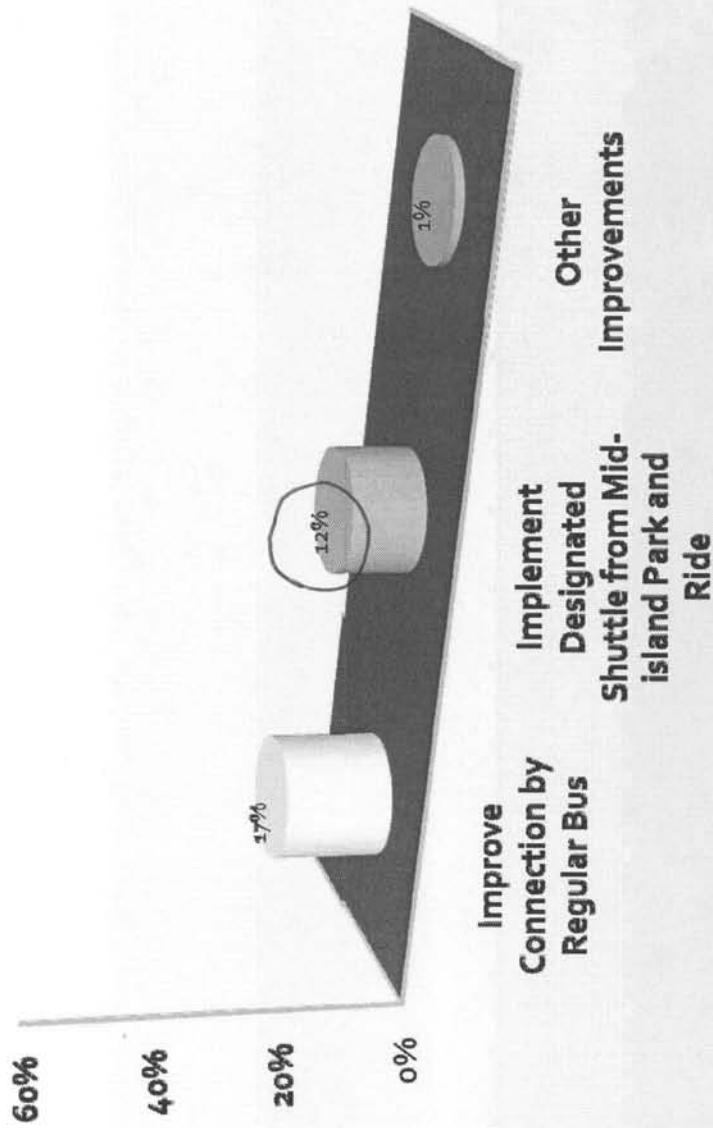


## Ferry Riders: How do you get to or from the Ferry on Nantucket



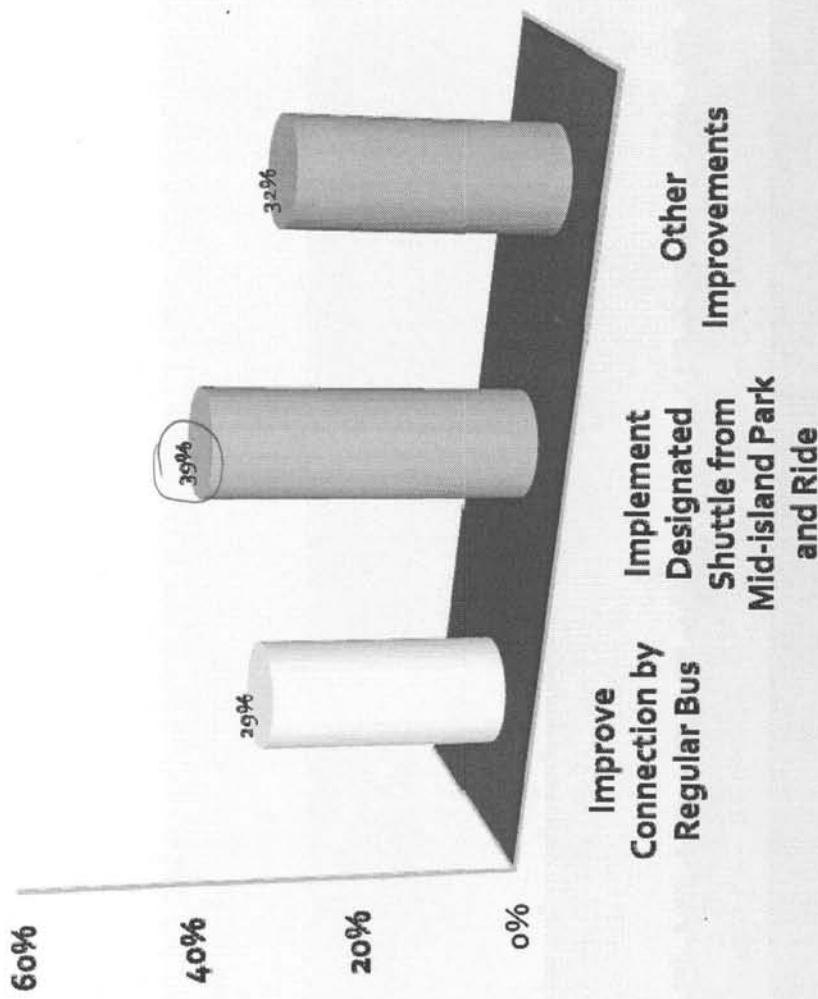
### Asked of Transit Riders

What Should be Done to Improve Access to the Ferry on Nantucket If You are not Satisfied with Current Options?



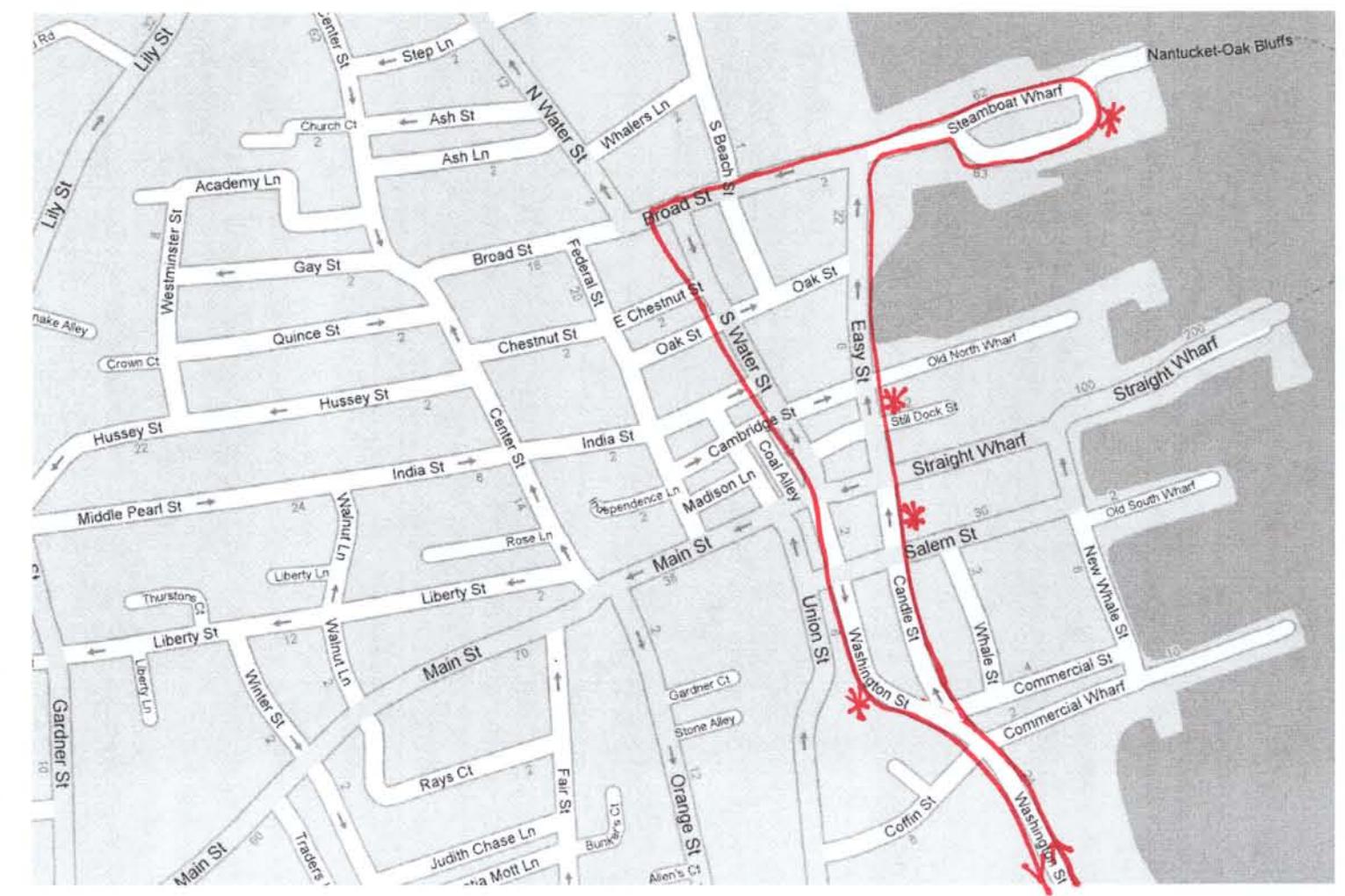
Asked of On-Line Respondents

What Should be Done to Improve Access to the Ferry on Nantucket If You are not Satisfied with Current Options?

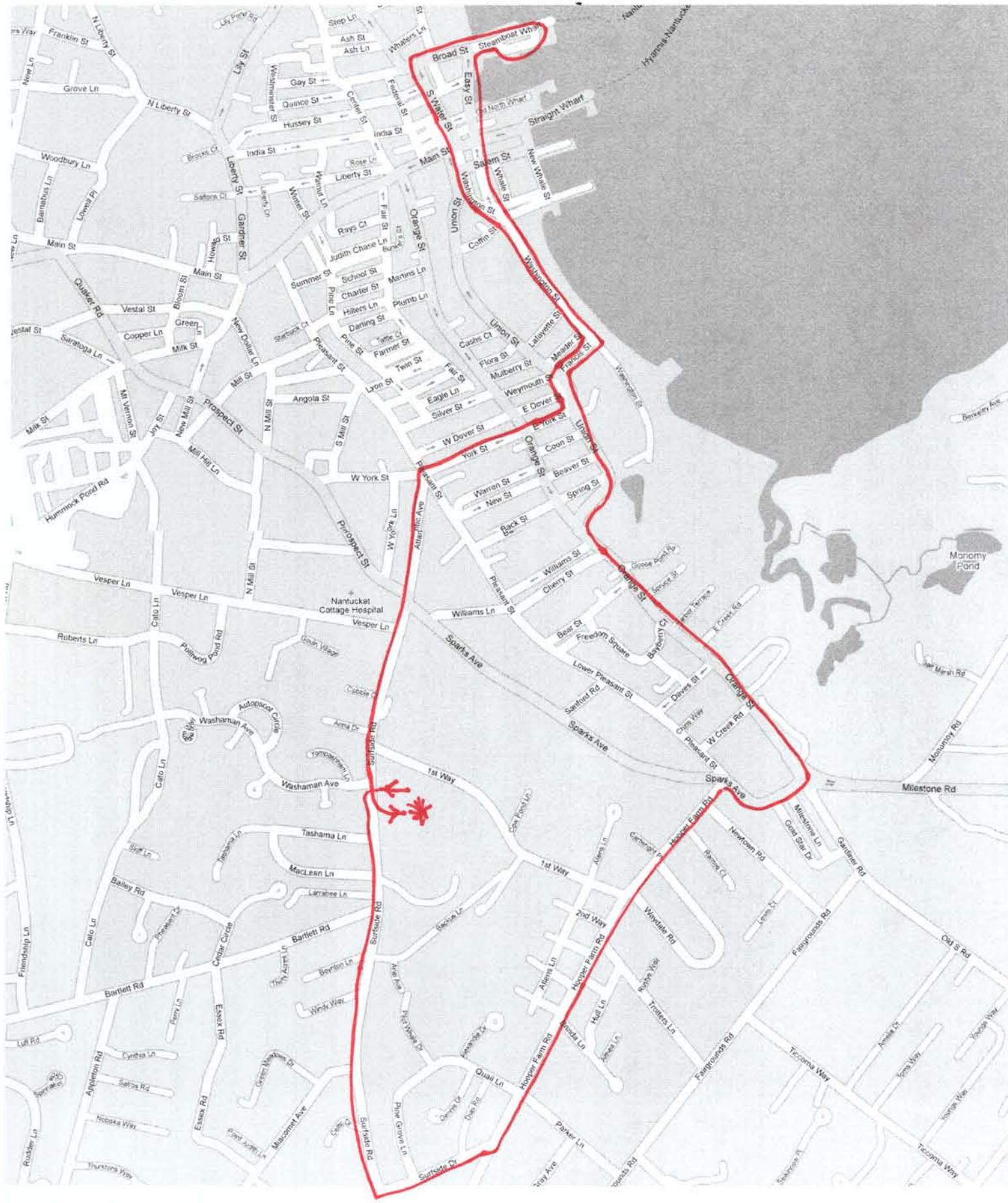




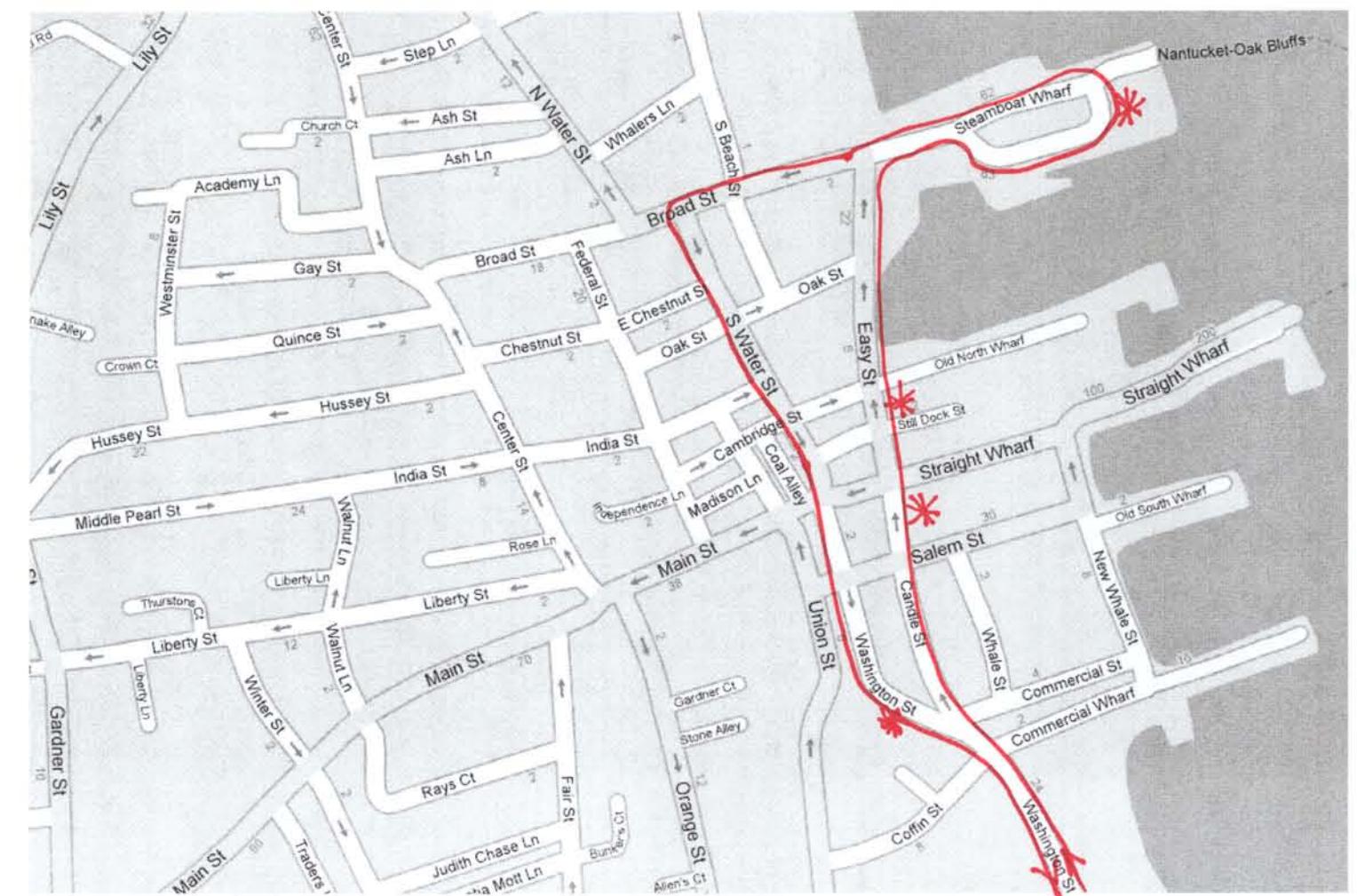
Elementary School  
Shuttle Bus Route  
option 1



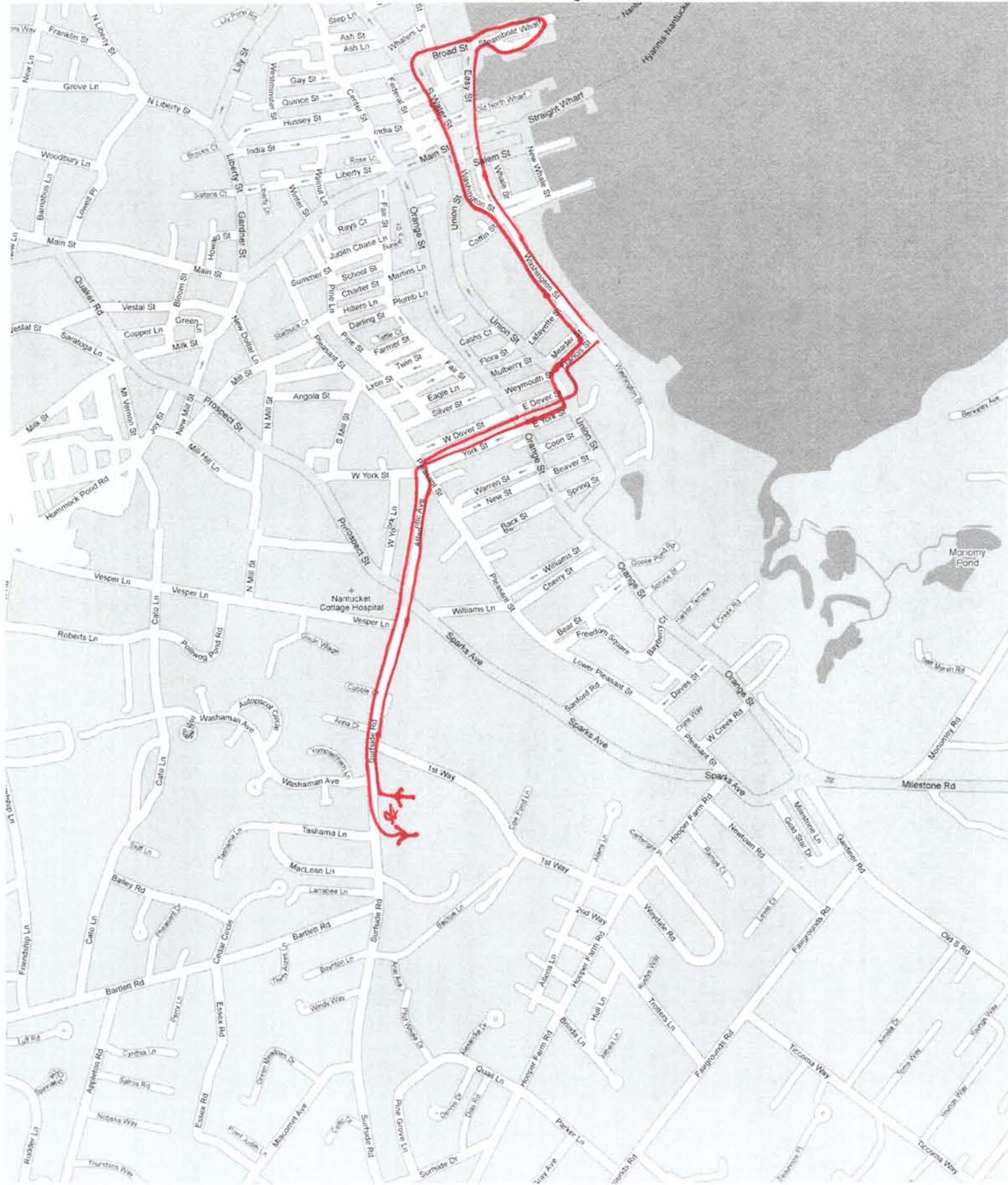
Source: Google Maps



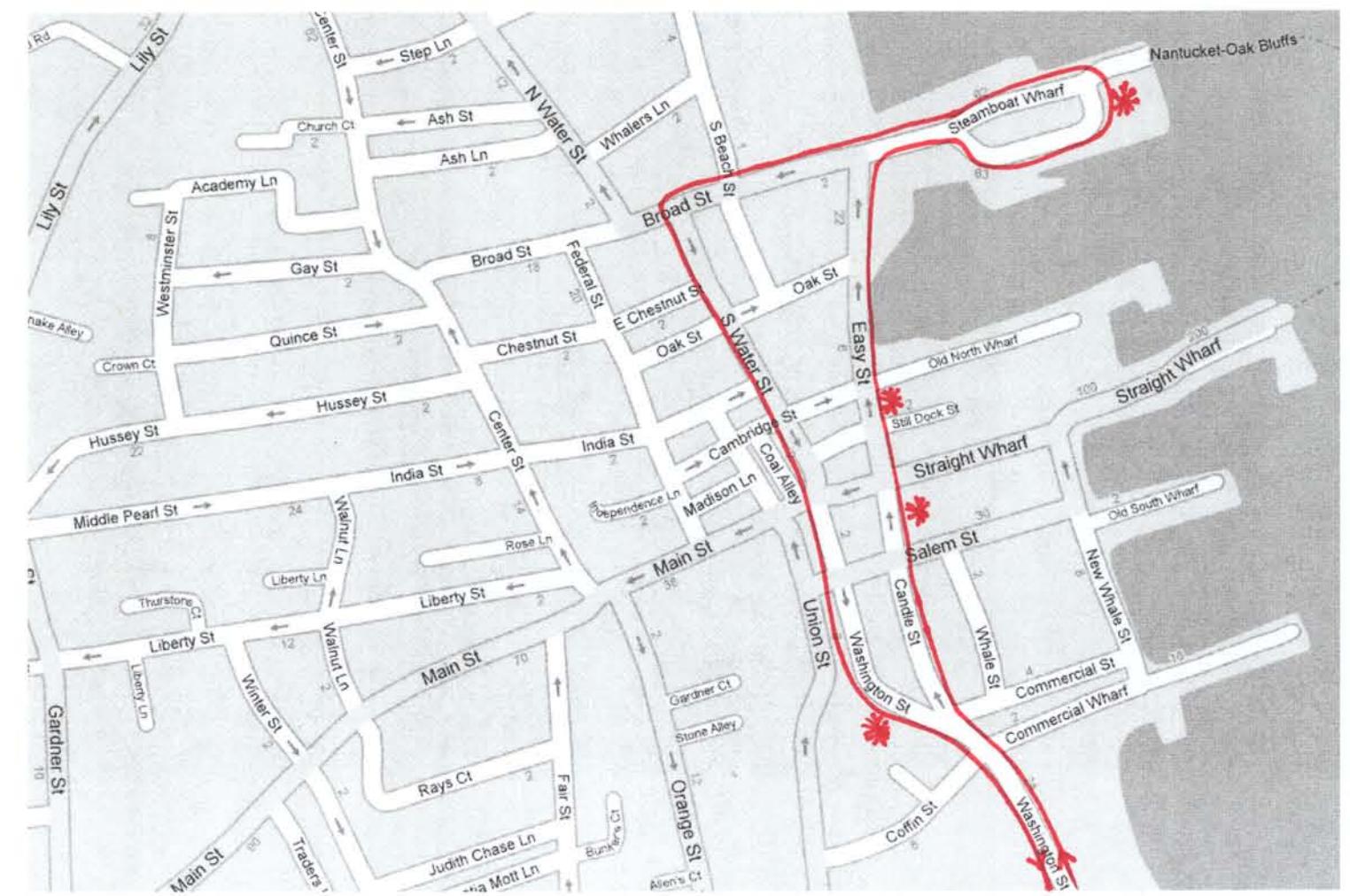
## Elementary School Shuttle Bus Route Option 2



Source: Google Maps



Elementary School  
Shuttle Bus Route  
option 3





Potential Hy-Line Shuttle Bus Stop- East side of Easy Street between Still Dock and Old North Wharf



Potential Hy-Line Shuttle Bus Stop – East side of Easy Street between Salem Street and Straight Wharf

**Table 1 Round Trip Times for Potential Shuttle Bus Routes**

	14-Jul			18-Aug		
	8:00 AM	10:00 AM	12:00 PM	8:00 AM	10:00 AM Hour	12:00 PM
<b><u>Two Fairgrounds Road Route</u></b>						
Leave Two Fairgrounds Road	0:00	0:00	0:00	0:00	0:00	0:00
To Salem Street	5:52	5:32	11:30	6:30	7:00	8:30
To Still Dock	6:17	6:23	13:30	7:00	7:45	9:00
To Steamboat Wharf	7:50	8:07	16:00	8:00	8:45	11:00
To Washington Street	11:35	10:40	22:30	10:10	11:30	13:15
Arrive Two Fairgrounds Road	<b>15:40</b>	<b>16:55</b>	<b>28:50</b>	<b>14:15</b>	<b>17:45</b>	<b>19:35</b>
<b><u>Elementary School Bus Route Option 1 (Left Out # 1)</u></b>						
Leave Elementary School	0:00	0:00	0:00	0:00	0:00	0:00
To Salem Street	12:30	12:20	17:10	8:15	11:30	8:25
To Still Dock	13:32	14:00	18:21	8:45	12:10	8:45
To Steamboat Wharf	15:00	16:10	19:35	9:45	13:45	10:00
To Washington Street	18:00	22:00	23:00	12:00	17:10	13:30
Arrive Elementary School	<b>23:30</b>	<b>27:00</b>	<b>28:00</b>	<b>17:30</b>	<b>22:10</b>	<b>18:30</b>
<b><u>Elementary School Bus Route Option 2 (Left Out # 2)</u></b>						
Leave Elementary School	0:00	0:00	0:00	0:00	0:00	0:00
To Salem Street	12:00	11:12	13:50	9:45	11:30	13:45
To Still Dock	12:30	11:30	15:20	10:30	13:00	14:15
To Steamboat Wharf	13:45	12:45	16:30	12:00	14:15	15:25
To Washington Street	18:00	14:40	20:15	14:30	16:10	17:30
Arrive Elementary School	<b>24:30</b>	<b>19:10</b>	<b>26:15</b>	<b>21:00</b>	<b>21:00</b>	<b>23:30</b>
<b><u>Elementary School Bus Route Option 3 (Right Out)</u></b>						
Leave Elementary School	0:00	0:00	0:00	0:00	0:00	0:00
To Salem Street	8:00	9:55	7:52	7:30	5:45	8:10
To Still Dock	8:20	10:45	8:47	8:00	6:30	9:00
To Steamboat Wharf	9:50	12:50	10:00	9:15	7:45	10:10
To Washington Street	13:00	16:40	12:50	13:00	11:30	11:50
Arrive Elementary School	<b>16:00</b>	<b>21:55</b>	<b>18:05</b>	<b>16:00</b>	<b>16:45</b>	<b>17:05</b>

## **Appendix D**

### **Calculation to Determine the Number of Buses Required to Accommodate Ferry Passenger Arrivals and Departures**

Calculation of Number of Shuttle Buses per Peak Summer Weekday						
Time	Arrivals on Ferries	Departures on Ferries	Estimated Passengers Boarding Bus at Wharf	Estimated Passengers Boarding Bus at Parking Lot	No. of buses at wharfs required for arriving passengers	No. of buses at parking lot required for departing passengers
6:00 AM	17	0	3	0	1	0
6:15 AM	0	0	0	0	0	0
6:30 AM	134	89	16	11	1	1
6:45 AM	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0
7:30 AM	85	0	11	0	1	0
7:45 AM	0	58	0	7	0	1
8:00 AM	150	0	18	0	1	0
8:15 AM	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0
8:45 AM	0	1	0	1	0	1
9:00 AM	265	0	32	0	2	0
9:15 AM	198	0	24	0	1	0
9:30 AM	410	65	49	8	2	1
9:45 AM	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0
10:15 AM	0	127	0	16	0	1
10:30 AM	0	126	0	15	0	1
10:45 AM	0	0	0	0	0	0
11:00 AM	179	0	22	0	1	0
11:15 AM	0	0	0	0	0	0
11:30 AM	8	23	1	3	1	1
11:45 AM	0	0	0	0	0	0
12:00 PM	174	138	21	17	1	1
12:15 PM	0	0	0	0	0	0
12:30 PM	0	91	0	11	0	1
12:45 PM	0	0	0	0	0	0
1:00 PM	143	0	17	0	1	0
1:15 PM	0	0	0	0	0	0
1:30 PM	44	128	6	16	1	1
1:45 PM	0	0	0	0	0	0
2:00 PM	94	0	12	0	1	0
2:15 PM	0	8	0	1	0	1
2:30 PM	0	0	0	0	0	0
2:45 PM	96	0	12	0	1	0
3:00 PM	0	0	0	0	0	0
3:15 PM	119	126	15	15	1	1
3:30 PM	0	0	0	0	0	0
3:45 PM	0	169	0	21	0	1
4:00 PM	0	295	0	36	0	2
4:15 PM	0	0	0	0	0	0
4:30 PM	123	257	15	31	1	2
4:45 PM	0	0	0	0	0	0
5:00 PM	16	0	2	0	1	0
5:15 PM	0	0	0	0	0	0
5:30 PM	0	161	0	20	0	1
5:45 PM	0	0	0	0	0	0
6:00 PM	0	154	0	19	0	1
6:15 PM	8	0	1	0	1	0
6:30 PM	87	0	11	0	1	0
6:45 PM	0	0	0	0	0	0
7:00 PM	115	0	14	0	1	0
7:15 PM	72	0	9	0	1	0
7:30 PM	0	0	0	0	0	0
7:45 PM	0	6	0	1	0	1
8:00 PM	73	0	9	0	1	0
8:15 PM	0	120	0	15	0	1
8:30 PM	0	74	0	9	0	1
8:45 PM	74	0	9	0	1	0
9:00 PM	0	38	0	5	0	1
9:15 PM	0	0	0	0	0	0
9:30 PM	0	0	0	0	0	0
9:45 PM	0	0	0	0	0	0
10:00 PM	0	10	0	2	0	1

% driving/drop off/pick up	38%
% Willing use PNR	25%
Passenger Capacity*	26
% Increase to account for non ferry passengers	25%

\*Assume IC HC vehicle

Calculation of Number of Shuttle Buses per Peak Summer Weekend						
Time	Arrivals	Departures	Estimated Passengers Boarding Bus at Wharf	Estimated Passengers Boarding Bus at Parking Lot	No. of buses at wharfs required for arriving passengers	No. of buses at parking lot required for departing passengers
6:00 AM	16	0	2	0	1	0
6:15 AM	1	0	1	0	1	0
6:30 AM	43	222	6	27	1	2
6:45 AM	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0
7:30 AM	194	0	24	0	1	0
7:45 AM	0	141	0	17	0	1
8:00 AM	191	0	23	0	1	0
8:15 AM	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0
8:45 AM	0	95	0	12	0	1
9:00 AM	262	0	32	0	2	0
9:15 AM	377	0	45	0	2	0
9:30 AM	266	348	32	42	2	2
9:45 AM	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0
10:15 AM	0	291	0	35	0	2
10:30 AM	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0
11:00 AM	312	0	38	0	2	0
11:15 AM	0	0	0	0	0	0
11:30 AM	44	58	6	7	1	1
11:45 AM	0	0	0	0	0	0
12:00 PM	268	316	32	38	2	2
12:15 PM	0	0	0	0	0	0
12:30 PM	0	320	0	38	0	2
12:45 PM	0	0	0	0	0	0
1:00 PM	235	0	28	0	2	0
1:15 PM	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0
2:00 PM	253	0	31	0	2	0
2:15 PM	0	16	0	2	0	1
2:30 PM	0	0	0	0	0	0
2:45 PM	223	0	27	0	2	0
3:00 PM	0	0	0	0	0	0
3:15 PM	101	194	12	24	1	1
3:30 PM	0	0	0	0	0	0
3:45 PM	0	230	0	28	0	2
4:00 PM	0	152	0	19	0	1
4:15 PM	0	0	0	0	0	0
4:30 PM	98	193	12	23	1	1
4:45 PM	0	0	0	0	0	0
5:00 PM	88	0	11	0	1	0
5:15 PM	0	0	0	0	0	0
5:30 PM	0	286	0	34	0	2
5:45 PM	0	0	0	0	0	0
6:00 PM	0	155	0	19	0	1
6:15 PM	0	0	0	0	0	0
6:30 PM	174	0	21	0	1	0
6:45 PM	0	0	0	0	0	0
7:00 PM	71	0	9	0	1	0
7:15 PM	68	0	9	0	1	0
7:30 PM	0	0	0	0	0	0
7:45 PM	0	6	0	1	0	1
8:00 PM	86	140	11	17	1	1
8:15 PM	0	83	0	10	0	1
8:30 PM	0	78	0	10	0	1
8:45 PM	28	0	4	0	1	0
9:00 PM	0	148	0	18	0	1
9:15 PM	0	0	0	0	0	0
9:30 PM	0	0	0	0	0	0
9:45 PM	0	0	0	0	0	0
10:00 PM	0	24	0	3	0	1

% driving/drop off/pick up	38%
% Willing use PNR	25%
Passenger Capacity*	26
% Increase to account for non ferry passengers	25%

\*Assume IC HC vehicle